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Tables of Second Virial Coefficients and Their First and Second Derivatives for the Stockmayer (*m*, 6, 3) Potential Function*

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Expressions are developed for the second virial coefficient and its first two temperature derivatives for polar molecules on the Stockmayer model of a dipole imbedded in a spherical core. In the case considered, the core molecules interact according to an $(m, 6)$ intermolecular potential function. Terms describing the dependence of these quantities on the polarizability of the dipole are also included. Tables are given for the cases $m=9$, 12, 18, 24, 36, and 60. These tables can be used to calculate the first density corrections to all of the thermodynamic properties of a fluid of polar molecules. The adequacy and accuracy of the tables are discussed in some detail.

Key words: Dipole; gas; intermolecular potential function; polar; second virial coefficient; Stockmayer.

1. Introduction

Effects on the thermodynamic properties of nonspherical molecules due to the presence of angular dependent terms in the potential function can be quite important. In some cases, these effects cause large deviations from two parameter corresponding states. Such angular dependent terms can be placed in two categories. There are those which are due to "permanent" orientation dependent forces resulting from the shape of the isolated molecules. In addition, there are induced nonspherical forces which arise from the change in the shape of a molecule due to the proximity of a second molecule. The former can be quite large while the latter are generally small. A significant difference between the two types of terms is associated with the fact that the relevant coefficients in the former (e.g., the dipole moment) are, in principle, usually measureable in experiments based on isolated atom effects (e.g. spectrocopy, see for example [1][1]) while those for the latter can rarely be determined separately and so are most often investigated with the help of a model and a parameter. Effects due to permanent orientation dependent forces are thus much more useful in the study of such effects on thermodynamic properties both because they are large and because they do not involve additional parameterization.

The formalism for including orientational effects of both the permanent and induced variety in the potential function has been developed by several authors [2, 3, 4, 5, 6, 7]. In the case of molecules with permanent dipole moments, Stockmayer accounted for effects of the first kind by using as a model a point dipole embedded in a spherical molecule of the Lennard-Jones type, and calculated the angularly dependent interaction between such molecules. Effects of the second type were added to this model later [2, 3]. For the case of the dipole interactions this can be done by introducing an effective dipole moment which is the sum of the permanent dipole moment of the isolated molecule and an induced dipole moment resulting from the proximity of the other polar molecule. The induced field can be written as an expansion in powers of the polarizability (which we shall regard here as isotropic and hence will use a mean value). Effects due to higher order permanent moments have been formulated [2, 3] but we shall not include them here mainly because these properties are usually, at best, only poorly known, and thus would require additional parameterization. Although Stockmayer actually only made use of the two functions corresponding to $m=24$ and $m=\infty$, his name is often associated with the general $(m, 6, 3)$ function family.

The particular Stockmayer potential function which corresponds to the value $m=12$ (i.e., the (12, 6, 3) function) has been given a position of importance in the study of the intermolecular potential functions of polar substances which is out of all proportion to its validity. One of the reasons for this distortion is due to the paucity of published tables for other functional forms. One of the purposes of this work is to correct that situation by providing tables for several members of the $(m, 6, 3)$ Stockmayer family of intermolecular potential functions. These tables were thought to be necessary for several reasons: first of all, in order to study the effect of the intermolecular repulsive forces, secondly, to provide additional flexibility in the

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[1] Figures in brackets indicate the literature references at the end of this paper.

fitting of experimental data for polar substances and thirdly, to provide a means for extending to polar molecular models studies of the sensitivity of thermodynamic properties to the details of the potential function. The studies were previously applied only to spherical molecules [9]. Results of such studies as applied to polar potentials will be published separately.

A feature of the tables presented here not present in other tabulations for polar potential functions [3, 8, 10, 11, 12] is the inclusion of directly calculated tables of both the first and second derivatives with respect to temperature of the functions from which the second virial coefficients are calculated.[2] These should allow for the correlation and prediction of other thermodynamic properties of polar gases such as the Joule-Thomson coefficient and the specific heats at low densities.

The choice of the $(m, 6, 3)$ potential function family was, of course, somewhat arbitrary. A study of the sensitivity of thermodynamic properties to the potential function in the case of spherical molecules (i.e. nonpolar in the present context) showed all reasonable three parameter functions to be equivalent when it came to predicting such properties [9]. Subsequently a very successful new correlation of nonpolar second virial coefficients was produced in which the authors arbitrarily chose to base their correlation entirely on the $(m, 6)$ function [13]. Furthermore, tables of collision integrals have now been published for the spherical $(m, 6)$ potential function [14]. The spherical $(m, 6)$ function has also been extended to quantum fluids with the preparation of tables of Wigner-Kirkwood corrections to the second virial coefficient for the $(m, 6)$ family [15]. It thus seemed appropriate to select the $(m, 6)$ as the form for the central part of the potential. With the publication of the present tables, there becomes available an extensive set of tables for the study of various variations on the $(m, 6)$ potential model.

2. Mathematical Preliminaries

Most of the details needed for the derivation of the required expressions are contained in the papers of Buckingham and Pople [3], of Stockmayer [7], and of Lennard-Jones [16] and will not be repeated here except to facilitate the connection with the work of those authors and to indicate departures from their approaches.

We choose to define the $(m, 6, 3)$ potential function in reduced form in terms of the parameters ϵ/k and σ of the spherical core through the expression

$$\Psi^*(r^*) = a\left[\left(\frac{1}{r^*}\right)^m - \left(\frac{1}{r^*}\right)^6\right] + \left(\frac{\mu^2}{\epsilon\sigma^3 r^{*3}}\right) X + \left(\frac{\alpha\mu^2}{\epsilon\sigma^6 r^{*6}}\right) Y + \left(\frac{\alpha^2\mu^2}{\epsilon\sigma^9 r^{*9}}\right) Z + \ldots \qquad (1)$$

where $r^* = r/\sigma$,

$$a = \left(\frac{6}{m-6}\right)\left(\frac{m}{6}\right)^{\frac{m}{m-6}},$$

$$X = 2\cos\theta_1\cos\theta_2 + \sin\theta_1\sin\theta_2\cos(\Phi_1+\Phi_2),$$

$$Y = -[3\cos^2\theta_1 + 3\cos^2\theta_2 - 2]/2,$$

$$= 1 - \tfrac{3}{2}(\cos^2\theta_1 + \cos^2\theta_2)$$

and

$$Z = 8\cos\theta_1\cos\theta_2 + \sin\theta_1\sin\theta_2\cos(\Phi_1+\Phi_2)$$

with the angles defined as in figure 1, where μ is the dipole moment and α is the mean polarizability of the molecule, assumed to be isotropic. It should be noted that σ is that value of r for which the *spherical* part of the potential function vanishes while ϵ/k is the well depth for this same spherical core (i.e., it is the well depth for the $(m, 6)$ and not for the $(m, 6, 3)$). This is consistent with the definition of Stockmayer [7] but is not consistent with that of Saxena and Joshi [10]. The latter made use in the (18, 6, 3) potential of a coefficient a which is appropriate to the Stockmayer (12, 6, 3) function. Because of this, their parameter ϵ/k does not have a clear meaning.

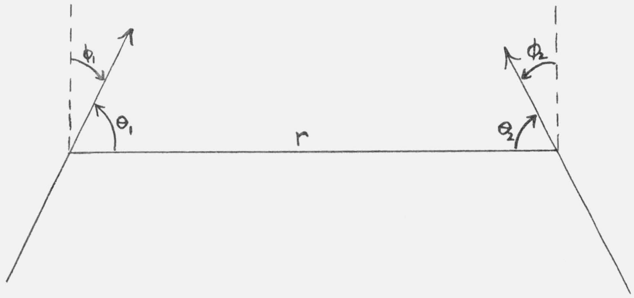

FIGURE 1.

The nonspherical terms in (1) have a strong effect on the potential function. Rowlinson [12] has plotted the potential (1) for $m=12$ for different dipole strengths including in the potential only the spherical and dipole terms, the latter for dipoles in the end-on position. His results show that the actual well depth for this end-on configuration for a reduced dipole moment $\tau (= \mu^2/\epsilon\sigma^3)$ of 4.0 is eight times the well depth for the nonpolar (12, 6) potential. In addition, he found that the polar part of the potential has the effect of making the sides of the potential well much steeper. In particular, Rowlinson found that the ratio of the coordinate at the potential minimum to that at the potential zero (i.e., r_{min}/σ) changed from 1.414 for $\tau=0$ to 1.002 for $\tau=4.0$.

These strong modifications of the spherical part of the potential function result directly from the inclusion of the effect of the dipole moment and so indicate a strong sensitivity of the predicted second virial coefficient to the magnitude of the dipole moment used.

[2] Reference [11] contains such tables calculated using numerical difference methods.

2.1. The Calculation of the Second Virial Coefficient

The second virial coefficient for angular dependent potential functions can be written:

$$B(T)=\frac{N\sigma^3}{8\pi}\int_0^\infty r^{*2}dr^*\int_0^\pi \sin\theta_1 d\theta_1\int_0^{2\pi} d\phi_1$$

$$\int_0^\pi \sin\theta_2 d\theta_2\int_0^{2\pi} d\Phi_2\left[1-\exp\left(-\frac{\epsilon\Psi^*(r^*)}{kT}\right)\right].$$

Following Buckingham and Pople [3], the exponential of the angular dependent part of the potential can be expanded by means of the exponential series and the integration over angles carried out. This is easily shown to lead to the series

$$B(T)=b_0B^*(T^*)=\frac{3b_0}{16\pi^2}\int_0^\infty r^{*2}dr^*\int_0^\pi \sin\theta_1 d\theta_1$$

$$\int_0^{2\pi} d\Phi_1\int_0^\pi \sin\theta_2 d\theta_2\int_0^{2\pi} d\Phi_2$$

$$\left[1-\exp\left(-\Psi_0^*(r^*)/T^*\right)\sum_{l,s,t=0}^{\infty}\frac{(-1)^{l+s+t}}{l!s!t!}\left(\frac{\tau}{T^*}\right)^{l+s+t}\right.$$

$$\left. q^{s+2t}X^lY^sZ^tr^{*-3(l+2s+3t)}\right] \qquad (2)$$

where $b_0=\frac{2\pi N}{3}\sigma^3$ is the classical hard sphere second virial coefficient and Ψ_0 is the spherical part of the potential (e.g., the first term of (1)), where we have defined a reduced dipole moment $\tau=\frac{\mu^2}{\epsilon\sigma^3}$ and a reduced mean polarizability $q=\frac{\alpha}{\sigma^3}$.

Following an implicit assumption of Buckingham and Pople, we consider the effect of polarizability to be small. This can be considered to be part of our molecular model, i.e., our model is now that of a point dipole of small polarizability imbedded in the center of a spherical molecule. According to this model, the second virial coefficient can be written in the form

$$B(T,\mu,\alpha)=b_0B^*(T^*,\tau,q)=b_0\sum_{p=0}^{\infty}A_p(T^*,\tau)q_p \qquad (3)$$

where the coefficients A_p contain the integrations over r and over angles, and where the effect of the dipole itself is evaluated to all orders of the reduced dipole moment in each term of the power series in the dipole polarizability.

2.2. The Coefficients A_p

According to (2), the coefficients A_p are given by

$$A_p(T^*,\tau)=3\int_0^\infty r^{*2}dr^*\left[1-\exp\left(-\frac{\Psi_0^*(r^*)}{T^*}\right)\right.$$

$$\left.\sum_{l=0}^{\infty}\sum_{[s,t]}^{*}\left(\frac{\tau}{T^*}\right)^{l+s+t} r^{*-3(l+2s+3t)}Q_{lst}\right] \qquad (4)$$

where $\sum\limits_{[s,t]}^{*}$ indicates that the summation extends over values of s and t such that $s+2t=p$ and where, according to appendix A, Q_{lst} is given by

$$Q_{lst}=\sum_{h=0}^{l}\sum_{i=0}^{s}\sum_{j=0}^{i}\sum_{k=0}^{t}C_\beta^\gamma$$

$$\frac{(h+k)!\left(\frac{v_1}{2}\right)!\left(\frac{v_2}{2}\right)!}{(v_1+1)!(v_2+1)!\left(\frac{v_1-h-k}{2}\right)!}$$

$$\frac{(v_1-h-k)!(v_2-h-k)!}{\left(\frac{v_2-h-k}{2}\right)!} \qquad (5)$$

where $h+k$ is even and

$$C_\beta^\gamma=C_{hlst}^{ijk}=\binom{l}{h}\binom{s}{i}\binom{i}{j}\binom{t}{k}2^{(l-i+3t-2k)}$$

$$\frac{(-3)^i}{l!s!t!}(-1)^{l+s+t}.$$

Here $v_1=l+t+2i-2j$ and $v_2=l+t+2j$.

According to our model, the index l (and hence h in eq (5)) must be summed over all its values for each value of p. It should be noted that stopping the series (3) at $p=0$ is equivalent to the assumption that the molecule is not polarizable. The resulting model is referred to as the rigid dipole model by Buckingham and Pople. Within the $p=0$ coefficient, it is convenient to exhibit the $l=0$ term for $p=0$ separately since this is the contribution of the spherical core. On designating this spherical contribution as $B_0(T^*)$, (4) becomes, for $p=0$,

$$A_0(T^*,\tau)=B_0(T^*)-D_0(T^*),$$

$$D_0(T^*,\tau)=-3\sum_{\substack{l=2\\ l\text{ even}}}^{\infty}\int_0^\infty (r^*)^{-3l}$$

$$\exp\left[-\Psi_0(r^*)/T^*\right]\left(\frac{\tau}{T^*}\right)^l Q_{l00}r^{*2}dr^* \qquad (6)$$

whereas for $p\neq 0$

$$A_{p\neq 0}=D_{p\neq 0}(T^*,\tau)=-3\sum_{\substack{l=2\\ l\text{ even}}}^{\infty}\sum_{[s,t]}^{*}\int_0^\infty (r^*)^{-3(l+2s+t)}$$

$$\exp\left[-\Psi_0(r^*)/T^*\right]\left(\frac{\tau}{T^*}\right)^{l+s+t}\times Q_{lst}r^{*2}dr^*. \qquad (6a)$$

These can be combined as

$$A_p(T^*, \tau) = B_0(T^*)\delta_{p0} + D_p(T^*, \tau)$$

where δ_{p0} is the Kronecker delta.

Following Buckingham and Pople [3], we define the functions $H_k^{(m,n)}(T^*)$ through the relation

$$\frac{1}{m}(T^*/a)^2 H_k^{(m,n)}(T^*) - \int_0^\infty \left(\frac{1}{r^*}\right)^k \exp\left[-\Psi_0(r^*)/T^*\right] r^{*2} dr^*. \quad (7)$$

Since we shall ultimately deal only with an $(m, 6)$ potential for the spherical core and shall never consider more than one value of m at a time, the superscripts (m, n) can be dropped without introducing any ambiguity. With this definition for $H_k(T^*)$, $D_p(T^*, \tau)$ becomes

$$D_p(T^*,\tau) = -3 \sum_{\substack{l=2 \\ l \text{ even}}}^{\infty} \sum_{[s,t]}^{*} H_{v_3}(T^*) \frac{1}{m}\left(\frac{T^*}{a}\right)^2 \left(\frac{\tau}{T^*}\right)^{l+s+t} Q_{lst}$$

where $v_3 = 3(l+2s+3t)$. With the help of this last eqs and (5) and (6) it is easy to show that the coefficient of the zeroth power of the dipole polarizability (corresponding to the rigid dipole) is given by

$$A_0(T^*,\tau) = B_0(T^*) + D_0(T^*,\tau)$$

$$= B_0(T^*) - \frac{3}{m}\sum_{i=1}^{\infty}\left[\frac{i!2^i}{(2i+1)!}\right]^2 \tau^{2i} \frac{(T^*)^{2-2i}}{a^2} H_{6i}(T^*) \sum_{j=0}^{i} \frac{(2j)!}{(j!)^2} \quad (8)$$

which, on the substitution of the values $m=12$ and $a=4$ as appropriate to the (12, 6, 3) potential, reduces to (3.10) of Buckingham and Pople. It should be noted that Buckingham and Pople introduce the variable y which for the $(m, 6)$ potential can be defined as $y = \left(\frac{a}{T^*}\right)^{1/2}$. Substitution of $T^* = ay^2$ in (8) above will yield the factor required for converting the quantity in the square bracket to the corresponding quantity in eq (3.10) of reference [3].

The variable y is the proper variable for eq (8) for describing convergence behavior. Since, however, we are concerned here only with the functional dependence of the equation and not its analytic behavior, we shall continue to use T^* here. (In the tables, both y and T^* are given).

A considerable simplification is obtained for the user of our tables if in $D_0(T^*, \tau)$ all factors independent of the dipole moment are combined. To this end, we define a set of functions $I_k(T^*)$ related to the $H_k(T^*)$ as follows:

$$I_k(T^*) = F(k) T^{*2-2k} H_{6k}(T^*) \quad (9)$$

where

$$F(k) = \frac{3}{a^2 m}(4)^k \left[\frac{k!}{(2k+1)!}\right]^2 \sum_{i=0}^{k} \frac{(2i)!}{(i!)^2}.$$

With the help of (9), (8) can then be written simply as

$$A_0(T^*, \tau) = B_0(T^*) - \sum_{k=1}^{\infty} I_k(T^*)\tau^{2k}. \quad (10a)$$

The coefficients A_p for $p \neq 0$ are somewhat more complicated due to the relaxation of the requirement that $s=t=0$. This adds more terms to the summation $\sum_{[s,t]}^{*}$ in (4). Thus, for example, for $p=1$, there is the requirement $s+2t=1$ which can only be satisfied for $s=1$, $t=0$ while for $p=2$ there is the requirement $s+2t=2$ which can be met by both $s=2$, $t=0$ and $s=0$, $t=1$. After some laborious algebra, the following results are obtained for $p \neq 0$:

$$A_p(T^*, \tau) = \left(\frac{T^*}{4}\right)^p \sum_{i=0}^{\infty} \tau^{(2i+p)} I_{i+p}(T^*) \frac{[(2i+2p+1)!]^2}{2^{2i}[(i+p)!]^2 S_p} \left(\sum_{i,s,t}^{*} Q_{2i,s,t} + \sum_{i,s,t}^{**} Q_{2i+1,s,t}\right)$$

where

$$S_p = \sum_{j=0}^{i+p} \frac{(2j)!}{(j!)^2}.$$

Here $\sum^{*}$ and $\sum^{**}$ each indicate $s+2t=p$ with the former requiring t to be even in the sum and the latter t to be odd.

For convenience to the users of the tables, we choose now to define a set of coefficients α_{ip} through the relation

$$A_p(T^*, \tau) = (T^*)^p \sum_{i=0}^{\infty} \alpha_{ip} \tau^{2i+p} I_{i+p}(T^*). \quad (10b)$$

Specifically

$$\alpha_{ip} \equiv \frac{4^{-(p+i)}[(2i+2p+1)!]^2}{[(i+p)!]S_p} \left(\sum_{i,s,t}^{*} Q_{2i,s,t} + \sum_{i,s,t}^{**} Q_{2i+1,s,t}\right).$$

Table 1 contains values of α_{ip} for p through 10, with, in each case, values of i running from 0 through 20. The adequacy of the number of coefficients presented in table 1 is discussed below in some detail.

TABLE 1

i \ p	α_{ip} 1	2	3	4	5
0	0.0000000	0.5500000+02	0.5141379+03	0.4120200+05	0.9707331+06
1	.3333333+01	.2505517+03	.4902545+04	.9966838+06	.4517405+08
2	.1158621+02	.7093636+03	.2273954+05	.8103094+07	.5670964+09
3	.2454545+02	.1607692+04	.7373551+05	.4047887+08	.3986518+10
4	.4174359+02	.3174600+04	.1926622+06	.1512202+09	.1978868+11
5	.6295059+02	.5687897+04	.4353661+06	.4639890+09	.7753931+11
6	.8810707+02	.9472656+04	.8857678+06	.1233316+10	.2556091+12
7	.1172156+03	.1490127+05	.1663803+07	.2937157+10	.7380649+12
8	.1502905+03	.2239381+05	.2934303+07	.6411564+10	.1918456+13
9	.1873439+03	.3241823+05	.4916837+07	.1303864+11	.4577321+13
10	.2283835+03	.4549046+05	.7896500+07	.2500028+11	.1017038+14
11	.2734141+03	.6217445+05	.1223568+08	.4561151+11	.2127683+14
12	.3224384+03	.8308218+05	.1838677+08	.7974850+11	.4227211+14
13	.3754584+03	.1088736+06	.2690586+08	.1343878+12	.8030724+14
14	.4324750+03	.1402568+06	.3846735+08	.2192745+12	.1466975+15
15	.4934892+03	.1779876+06	.5387958+08	.3477383+12	.2588470+15
16	.5585013+03	.2228701+06	.7410138+08	.5376780+12	.4428640+15
17	.6275119+03	.2757563+06	.1002596+09	.8127364+12	.7370506+15
18	.7005212+03	.3375462+06	.1336675+09	.1203687+13	.1196489+16
19	.7775295+03	.4091877+06	.1758444+09	.1750062+13	.1898981+16
20	.8585368+03	.4916769+06	.2285359+09	.2502037+13	.2952648+16

i \ p	6	7	8	9	10
0	0.1294197+09	0.7545577+10	0.8413075+12	0.6715625+14	0.1332794+17
1	.4053737+10	.2842242+12	.6556027+14	.8180735+16	.1272523+19
2	.5249590+11	.4324812+13	.1495321+16	.2490697+18	.4064630+20
3	.4167055+12	.3991419+14	.1848105+17	.3884674+19	.7041412+21
4	.2394359+13	.2646274+15	.1548148+18	.3973430+20	.8116767+22
5	.1090498+14	.1381173+16	.9849835+18	.3016918+21	.6958387+23
6	.4164352+14	.6004971+16	.5093509+19	.1829913+22	.4752964+24
7	.1384478+15	.2258767+17	.2237911+20	.9302205+22	.2709267+25
8	.4114908+15	.7550668+17	.8616638+20	.4097642+23	.1331826+26
9	.1114870+16	.2288022+18	.2973750+21	.1602723+23	.5785209+26
10	.2794339+16	.6380513+18	.9357272+21	.5669677+24	.2262244+27
11	.6553784+16	.1656904+19	.2720343+22	.1840128+25	.8080441+27
12	.1451445+17	.4044583+19	.7384036+22	.5541970+25	.2667265+28
13	.3057591+17	.9351958+19	.1887349+23	.1563154+26	.8213929+28
14	.6163506+17	.2061175+20	.4574366+23	.4160481+26	.2378431+29
15	.1194817+18	.4352991+20	.1057434+24	.1051535+27	.6518220+29
16	.2236701+18	.8847902+20	.2342845+24	.2537146+27	.1700086+30
17	.4057697+18	.1737424+21	.4995829+24	.5870413+27	.4240033+30
18	.7155269+18	.3306632+21	.1028951+25	.1307604+28	.1015292+31
19	.1229633+19	.6116365+21	.2053262+25	.2813350+28	.2342442+31
20	.2063989+19	.1102261+22	.3980369+25	.5863817+28	.5223271+31

2.3. Recursion Relations for the $I_k(T^*)$

Recursion relations for the $H_k(T^*)$ have been published for the particular cases $m=12$, [3], and $m=18$, [10]. The generalization of these to include all of the $(m, 6, 3)$ functions is

$$H_{6k}=\frac{T^*}{a}\left(\frac{6k-3-m}{m}\right)H_{6k-m}+\frac{6}{m}H_{6k-m+6}. \qquad (11)$$

Using (11) and (9), recursion relations can be derived for the $I_k(T^*)$. To avoid confusion between the functional dependence on T^* and the explicit appearance of T^*, we shall not indicate the argument of the I_k in what follows.

$$I_k=\left(\frac{6k-3-m}{am}\right)\frac{F(k)}{F\left(k-\frac{m}{6}\right)}(T^*)^{\left(1-\frac{m}{3}\right)}I_{k-\frac{m}{6}}$$

$$+\frac{6}{m}\frac{F(k)}{F\left(k-\frac{m}{6}+1\right)}(T^*)^{\left(2-\frac{m}{3}\right)}I_{k-\frac{m}{6}+1}$$

which, for later convenience, we shall write

$$I_k=K_1T^{*\left(1-\frac{m}{3}\right)}I_{k-\frac{m}{6}}+K_2T^{*\left(2-\frac{m}{3}\right)}I_{k-\frac{m}{6}+1}. \qquad (12)$$

By applying this recursion relation to the $I_{k-\frac{m}{6}}$ and the $I_{k-\frac{m}{6}+1}$ in the right side of (12), it is possible to obtain a recursion relation for values of m which are odd multiples of three. This avoids the necessity for tables of the I_k for half integral multiples of k as would otherwise have been required, for example, for $m=9$ with (12). The recursion relation obtained is

$$I_k=\left(\frac{6k-3-m}{am}\right)\left(\frac{6k-3-2m}{am}\right)\frac{F(k)}{F\left(k-\frac{m}{3}\right)}T^{*\left(2-\frac{2m}{3}\right)}I_{k-\frac{m}{3}}$$

$$+\frac{6}{m}\left(\frac{12k-3m}{am}\right)\frac{F(k)}{F\left(k-\frac{m}{3}+1\right)}T^{*\left(3-\frac{2m}{3}\right)}I_{k-\frac{m}{3}+1}$$

$$+\frac{36}{m^2}\frac{F(k)}{F\left(k-\frac{m}{3}+2\right)}T^{*\left(4-\frac{2m}{3}\right)}I_{k-\frac{m}{3}+2}$$

which, for later convenience, we shall write

$$I_k=K_1T^{*\left(2-\frac{2m}{3}\right)}I_{k-\frac{m}{3}}+K_2T^{*\left(3-\frac{2m}{3}\right)}I_{k-\frac{m}{3}+1}+K_3T^{*\left(4-\frac{2m}{3}\right)}I_{k-\frac{m}{3}+2} \qquad (12a)$$

These relations makes it unnecessary to tabulate the functions I_k for values of k beyond $k=\frac{m}{6}$ for those potentials for which m is an exact multiple of 6 or for values of k beyond $k=\frac{m}{3}$ for those potentials for which m is an odd multiple of 3. For convenience in using (12), we have included in table 2, values of the coefficients K_1 and K_2 for 20 values of k for those values of m which are exact multiples of six along with values of the coefficients K_1, K_2, and K_3 for $m=9$ for use with (12a).

3. The First and Second Derivatives of *B(T)*

The first and second derivatives of the second virial coefficient are of considerable utility. These appear in expressions for the first density correction of the various thermodynamic functions (e.g., Joule-Thomson coefficient, specific heat, etc.).

According to (3) and (10), the derivatives of B with respect to temperature can be evaluated given expressions for the derivatives of the $I_k(T^*)$ with respect to the temperature. Thus,

$$T\frac{dB}{dT}=b_0T^*\frac{dB^*}{dT^*}=\sum_{p=0}^{\infty}T^*\frac{dA_p}{dT^*}q^p. \qquad (13)$$

Where A_p depends on T^* and τ. Now, according to (10b),

$$T^*\frac{dA_p}{dT^*}=(T^*)^p\sum_{i=0}^{\infty}\alpha_{ip}\tau^{2i+p}\left[pI_{i+p}+T^*\frac{dI_{i+p}}{dT^*}\right] \qquad (14a)$$

with the relation for $p=0$ given by

$$T^*\frac{dA_0}{dT^*}=T^*\frac{dB_0^*}{dT^*}-\sum_{k=1}^{\infty}T^*\frac{dI_k}{dT^*}\tau^{2k}. \qquad (14b)$$

The second derivative required is given by

$$T^2\frac{d^2B}{dT^2}=b_0(T^*)^2\frac{d^2B^*}{dT^{*2}}=b_0\sum_{p=0}^{\infty}(T^*)^2\frac{d^2A_p}{dT^{*2}}q^p \qquad (15)$$

where

$$T^{*2}\frac{d^2A_p}{dT^{*2}}=T^{*p}\sum_{i=0}^{\infty}\alpha_{ip}\tau^{2i+p}\left[p(p-1)I_{i+p}\right.$$

$$\left.+(p+1)T^*\frac{dI_{i+p}}{dT^*}+T^{*2}\frac{d^2I_{i+p}}{dT^{*2}}\right] \qquad (16a)$$

with the relation for $p=0$ given by

$$T^*\frac{d^2A_0^*}{dT^{*2}}=T^{*2}\frac{d^2B_0^*}{dT^{*2}}-\sum_{k=1}^{\infty}T^{*2}\frac{d^2I_k}{dT^{*2}}\tau^{2k}. \qquad (16b)$$

TABLE 2. *Values of the coefficients for eq (12)*

k	K_1	K_2
(12, 6) $a=4.000000$		
3	0.49319728 − 03	0.32879819 − 01
4	.51965231 − 03	.21072797 − 01
5	.38591246 − 03	.14650639 − 01
6	.27553766 − 03	.10746978 − 01
7	.19837657 − 03	.82039216 − 02
8	.14575616 − 03	.64605980 − 02
9	.10952479 − 03	.52162255 − 02
10	.84076210 − 04	.42981889 − 02
11	.65800490 − 04	.36020911 − 02
12	.52390291 − 04	.30619811 − 02
13	.42352551 − 04	.26346187 − 02
14	.34702435 − 04	.22907323 − 02
15	.28776600 − 04	.20099494 − 02
16	.24118928 − 04	.17777436 − 02
17	.20409609 − 04	.15835346 − 02
18	.17420300 − 04	.14194704 − 02
19	.14985220 − 04	.12796253 − 02
20	.12982149 − 04	.11594599 − 02

k	K_1	K_2
(18, 6) $a=2.5980762$		
4	0.21334855 − 04	0.92382632 − 03
5	.15628463 − 04	.41163991 − 03
6	.85137709 − 05	.20993346 − 03
7	.46403348 − 05	.11755649 − 03
8	.26309339 − 05	.70669652 − 04
9	.15607384 − 05	.44933248 − 04
10	.96637297 − 06	.29893763 − 04
11	.62169112 − 06	.20643291 − 04
12	.41359804 − 06	.14706047 − 04
13	.28334491 − 06	.10756203 − 04
14	.19915937 − 06	.80469414 − 05
15	.14318315 − 06	.61390079 − 05
16	.10501599 − 06	.47642327 − 05
17	.78402951 − 07	.37534913 − 05
18	.59471361 − 07	.29970408 − 05
19	.45759922 − 07	.24218537 − 05
20	.35666926 − 07	.19782322 − 05

k	K_1	K_2
(24, 6) $a=2.1165347$		
5	0.57552474 − 06	0.20301968 − 04
6	.30925759 − 06	.66358277 − 05
7	.12860599 − 06	.25834164 − 05
8	.55200089 − 07	.11392278 − 05
9	.25268767 − 07	.55294326 − 06
10	.12351888 − 07	.28969738 − 06
11	.64093976 − 08	.16152009 − 06
12	.35050556 − 08	.94814050 − 07
13	.20063837 − 08	.58117237 − 07
14	.11951090 − 08	.36959374 − 07
15	.73706131 − 09	.24260917 − 07
16	.46868253 − 09	.16370373 − 07
17	.30619686 − 09	.11316491 − 07
18	.20491630 − 09	.79919549 − 08
19	.14012268 − 09	.57526337 − 08
20	.97691942 − 10	.42120633 − 08

k	K_1	K_2
(36, 6) $a=1.7171629$		
7	0.16678404 − 09	0.47732562 − 08
8	.53876233 − 10	.93790327 − 09
9	.14245343 − 10	.23216258 − 09
10	.40678439 − 11	.68111613 − 10
11	.12858991 − 11	.22829137 − 10
12	.44778876 − 12	.85206064 − 11
13	.16994959 − 12	.34746859 − 11
14	.69529587 − 13	.15259262 − 11
15	.30363797 − 13	.71356436 − 12
16	.14036033 − 13	.35216612 − 12
17	.68199773 − 14	.18212628 − 12
18	.34627036 − 14	.98125349 − 13
19	.18280688 − 14	.54813772 − 13
20	.99930413 − 15	.31619886 − 13

k	K_1	K_2
(60, 6) $a=1.4350552$		
11	0.99962681 − 18	0.23908666 − 16
12	.15304192 − 18	.22265289 − 17
13	.20438429 − 19	.27837096 − 18
14	.31104820 − 20	.43525293 − 19
15	.54865676 − 21	.81403008 − 20
16	.11092608 − 21	.17639573 − 20
17	.25304070 − 22	.43235742 − 21
18	.64149301 − 23	.11765568 − 21
19	.17835120 − 23	.35027587 − 22
20	.53771351 − 24	.11274862 − 22

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TABLE 2. *Values of the coefficients for eq (12)* — Continued

k	K_1	K_2	K_3
		(9, 6) a=6.7500000	
4	0.32441637 − 05	0.63869474 − 03	0.18731375 − 01
5	.35646803 − 05	.44721373 − 03	.13022790 − 01
6	.25891966 − 05	.31101253 − 03	.95528695 − 02
7	.17640155 − 05	.22059983 − 03	.72923747 − 02
8	.12001742 − 05	.16053353 − 03	.57427537 − 02
9	.83063691 − 06	.11982199 − 03	.46366449 − 02
10	.58778410 − 06	.91526584 − 04	.38206124 − 02
11	.42540270 − 06	.71359524 − 04	.32018588 − 02
12	.31445720 − 06	.56645513 − 04	.27217610 − 02
13	.23696881 − 06	.45680666 − 04	.23418832 − 02
14	.18170424 − 06	.37353703 − 04	.20362065 − 02
15	.14152017 − 06	.30922410 − 04	.17866217 − 02
16	.11178063 − 06	.25879783 − 04	.15802165 − 02
17	.89414252 − 07	.21872196 − 04	.14075863 − 02
18	.72345403 − 07	.18648254 − 04	.12617515 − 02
19	.59144896 − 07	.16026093 − 04	.11374447 − 02
20	.48811399 − 07	.13872048 − 04	.10306310 − 02

Thus, given the first and second derivatives of the $I_k(T^*)$ integrals, the first and second derivatives of the second virial coefficient are easily evaluated.

It is clear from (9) that a knowledge of the temperature derivatives of the $H_k(T^*)$ is equivalent to a knowledge of such derivatives for the $I_k(T^*)$. Now, for a potential function made up of a sum of inverse powers of the intermolecular potential function, the derivatives of the $H_k(T^*)$ can be written in terms of the $H_k(T^*)$ themselves. Thus, according to (7) and reference [17], for the $(m, 6)$ function,

$$T^* \frac{dH_k}{dT^*} = \frac{a}{T^*}\left[H_{k+m} - H_{k+6}\right] - 2H_k$$

$$T^{*2}\frac{d^2H_k}{dT^2} = \left(\frac{a}{T^*}\right)^2 \{H_{k+2m} + H_{k+12} - 2H_{k+m+6}\} - 6\frac{a}{T^*}\{H_{k+m} - H_{k+6}\} + 6H_k. \qquad (17)$$

On differentiating (9) and making use of (17) one easily obtains expressions for the derivatives of the $I_k(T^*)$ in terms of the $I_k(T^*)$ functions themselves. Thus

$$T^*\frac{dI_k}{dT^*} = -2kI_k + \left(\frac{a}{T^*}\right)\left[T^{*\frac{m}{3}}\frac{F(k)}{F\left(k+\frac{m}{6}\right)}I_{k+\frac{m}{6}} - T^{*2}\frac{F(k)}{F(k+1)}I_{k+1}\right] \qquad (18)$$

and

$$T^{*2}\frac{d^2I_k}{dT^{*2}} = 2k(2k+1)I_k + (2+4k)\frac{a}{T^*}\left[T^{*2}\frac{F(k)}{F(k+1)}I_{k+1} - T^{*\frac{m}{3}}\frac{F(k)}{F\left(k+\frac{m}{6}\right)}I_{k+\frac{m}{6}}\right]$$
$$+\left(\frac{a}{T^*}\right)^2\left[T^{*2\frac{m}{3}}\frac{F(k)}{F\left(k+\frac{m}{3}\right)}I_{k+\frac{m}{3}} + T^{*4}\frac{F(k)}{F(k+2)}I_{k+2} - 2T^{*\left(\frac{m}{3}+2\right)}\frac{F(k)}{F\left(k+\frac{m}{6}+1\right)}I_{k+\frac{m}{6}+1}\right] \qquad (19)$$

Obviously, the recursion relation (12), can be used to develop recursion relations for the derivatives using (18) and (19).

4. Numerical Methods

The integral which appears on the right-hand side of (7) is the basic quantity which needs to be evaluated numerically. An extensive number of such evaluations is required, however. In particular, one such integral needs to be calculated for each value of k, at each T^* with the entire set of T^* values being repeated for each potential function. An automatic method for testing the accuracy of the numerical procedure is clearly required.

The accuracy of numerical integration depends directly on the spacing of the grid of points used to represent the integrand numerically. This depends, in turn, on the rapidity with which the integrand varies as a function of its argument. The potential functions of interest vary rapidly with intermolecular distance for small distances. For large distances, they are characterized by a much slower dependence on distance. As a result, a grid of points which is adequate for small intermolecular separations becomes excessive for large separations. This behavior led us to choose to divide the overall integration range into more than one part and to attempt to optimize the grid spacing separately in each such part. We have, in fact, divided the total range into a total of five parts and, for flexibility, have defined the limits of each part in the input data.

A Gaussian integration scheme was employed in each integration segment with the number of points to be used also supplied in the input. This integration was actually performed, in each interval, at each temperature, both for the given number of integration points for that interval and for half that number of points. The two results were then compared and required to agree within a preassigned tolerance. When the tolerance was not satisfied in an interval at any temperature, the basic number of integration points was doubled and new integrations carried out in that interval at that temperature for both the new basic number of points and for half that number of points. A comparison was made between these two new results to the same tolerance. This procedure was continued until either a requirement that there be 128 points in the interval was reached or until the tolerance was satisfied, whichever came first. The ability to redefine the integration intervals guaranteed that the tolerance would always ultimately be satisfied. This occasionally required the use of quite small intervals for small r.

A second accuracy problem is that associated with the choice of a practical upper limit for the integral in (7). At large values of r the repulsive term in Ψ_0 will be small compared to the attractive term and can be neglected. Then, expanding the exponential in eq (7) we have

$$e^{-\Psi_0(r^*)} = \left[1 - \frac{a}{r^6} \cdots\right].$$

Clearly, for $r_f^* = r^* \geqslant 10$ the second term on the right will be negligible to our desired accuracy and we can replace $e^{-\Psi_0(r^*)}$ in eq (7) by unity. The integral can then be evaluated analytically from r_f^* to infinity yielding $[(r_f^*)^{3-k}/(3-k)]$, independent of particular choice of the repulsive power in the potential function.

Once the integrals in (7) were evaluated as described, the functions I_k could be calculated using (9). The derivatives of the I_k were then obtained through the use of eqs (18) and (19). The ability to calculate these derivatives directly resulted in a sensitive check on the tabulated functions. This was accomplished by computing these same derivatives from the I_k by a numerical difference method and comparing the results with the directly calculated values. The result of such a comparison is described below.

5. The Tables, Their Use, Accuracy, and Adequacy

This paper contains sufficient information to allow the calculation of the first density correction to all of the thermodynamic properties of a fluid whose molecules are polarizable point dipoles imbedded in spherically symmetric bodies which, in the absence of the dipole moment, would interact with each other according to an $(m, 6)$ force law. The main part of the paper consists of tables of second virial coefficients and their first and second derivatives for a spherically symmetric $(m, 6)$ potential and of the functions I_k and their first and second derivatives for the corresponding potential. Tables are included for $m=9$, 12, 18, 24, 36, and 60. These tables have been examined very carefully for errors and in order to estimate their accuracy and adequacy. The tables were differenced in order to flush out obvious errors, to produce an estimate of internal accuracy, and to determine a spacing of the temperature argument such that a third order interpolation formula might easily suffice at all temperatures. In this process the tables were found to have been calculated to an accuracy of at least one part in 10,000.

5.1. The Use of the Tables

The tables included in this paper are designed for the calculation of the second virial coefficient and its first two temperature derivatives for a molecular model which consists of a polarizable dipole imbedded in a spherical core. Inclusion of tables of these quantities for the central core potential allows these tables to be used for nondipolar molecules as well.

The tables are designed for use with eqs (3), (13), and (15). The left hand members of those equations refer to the quantities of interest at an experimental temperature T, with a dipole moment μ and a polarizability α. As will become clear below, the right-hand members of these equations can be calculated for a given experimental temperature, dipole moment and polarizability through the use of the tables included in this publication for particular choices of the intermolecular potential parameters ϵ/k and σ. It should be noted that where μ and/or α are not known, they can also be used as parameters. In most applications, the quantities calculated using eqs (3), (13), and (15) are to be compared with corresponding experimental quantities in order to establish "best" values for the unknown parameters ϵ/k and σ (and, on occasion either, or both, α and μ). Methods for doing this have been described [5, 8]. We shall consider the discussion of such methods to be outside the scope of this paper.

We wish to point out, however, that methods generally used can be improved on considerably through the use of recently developed nonlinear search methods [18].

The purpose of the present section is to describe the way in which actual computations are to be carried out using tables 1–3. Equations (10a), (10b), (14a), (14b), (16a), and (16b) are the actual working equations associated with (3), (13), and (15). Each of these working equations contains the quantity α_{ip} along with appropriate combinations of the quantities I_{i+p},

$$T^* \frac{dI_{i+p}}{dT^*} \text{ and } T^{*2} \frac{d^2I_{i+p}}{dT^{*2}}.$$

As mentioned earlier, the quantity α_{ip} is presented in table 1 for values of p from 0 through 10 with, in each case, i running from 0 through 20. Appendix B contains listings of the computer subroutines needed for extending table 1 to still higher values of i and p. For each value of m table 3 contains the second virial coefficient and its first two temperature derivatives for the central potential. This corresponds to the first terms in eqs (10a), (14b), and (16b). Table 3 also contains the quantities

$$I_k,\ T^* \frac{dI_k}{dT^*} \text{ and } T^{*2} \frac{d^2I_k}{dT^{*2}}$$

as required for completing the quantities required for the evaluation of the working equations. It should be noted that table 3 contains only those values of k needed to produce closure in the recursion relations (12) and (12a). This closure in effect includes the quantities $T^* \frac{dI_k}{dT^*}$ and $T^{*2} \frac{d^2I_k}{dT^{*2}}$ when use is made of eqs (18) and (19). As has been pointed out above, (12) and (12a) and (18) and (19) can be used to produce recursion relations for the derivatives themselves.

In summary, eqs (3), (13), and (15) can be evaluated through the use of the working equations (10a, b), (14a, b), and (16a, b) where table 1 (with appendix B used when necessary) contains values of α_{ip}, table 3 contains terms corresponding to the contribution of the central potential and (with proper use made of (12), (18), and (19)) the necessary values of the quantities I_k,

$$T^* \frac{dI_k}{dT^*} \text{ and } T^{*2} \frac{d^2I_k}{dT^{*2}}.$$

5.2. The Adequacy of Table 1

The adequacy of table 1 for any particular experimental data point will depend on the value of T^* associated with that data point as well as on the values of τ and q associated with the substance. In order to examine this adequacy in a general fashion, we calculated the terms of (10) corresponding to each member of table 1 for the particular case $m=12$ and for selected values of T^* and τ. The calculations were carried out for τ values through 4 in order to be sure to include a representation of the situation for even the most polar substance. In each case, the value of $T^*=0.3$ was taken as a lower limit in order to include a reduced temperature well below what might be the lowest reached in practice.

Table 1 is, by definition, adequate for those situations for which convergence in (3) occurs when only terms whose values are contained in table 1 are used. Choice of particular criteria for convergence in (3) are somewhat arbitrary. The adequacy of a particular criterion for a given data points depends, first of all, on the accuracy of the experimental data being analyzed. The adequacy for such a data point depends further on the contribution which that data point will make to the entire set of data being analyzed, i.e., on its contribution to the sum of the squares of the deviations summed over all data points. It depends, therefore, on the number of data points and on their distribution.

It is convenient to take different convergence criteria with respect to i and to p. Thus, for the series in i, we consider there to be convergence by a given term when that term contributes less than one part in 10,000 to the sum. With respect to p, we consider there to be convergence by a given term when the ratio of the value of that term to that of the $p-1$ term is less than 0.001. These criteria are clearly adequate. Since they may be excessively stringent, we have in the following also inserted remarks appropriate to less stringent criteria. Our results can be summarized as follows:

A. Convergence with respect to i

(1) Convergence in i is only weakly dependent on p.

(2) For $T^* \geqslant 0.4$ convergence always occurs by 20 terms.

(3) For $T^*=0.3$, 20 terms in i are adequate for $\tau \leqslant 3$. For $\tau=4$, the term $i=21$ contributes approximately one part in a hundred to the sum with indications that at most 25 terms will be needed in order to meet the convergence criteria. Thus table 1 is adequate with respect to i even for $\tau=4$ when there are a sufficient number of data points so that the contribution of one part in one hundred for a point in the immediate vicinity of $T^*=0.3$ is negligible.

B. Convergence with respect to p

Convergence with respect to p depends very strongly on the value of q. Values for this parameter are not known with any great certainty. Buckingham and Pople obtained values in the neighborhood of 0.1. This value is of questionable accuracy since it is more than likely that a sufficient number of terms was not included by them. This is partly indicated by the fact that the values of σ, the hard core diameter, reported by them are, in general, unrealistically small for the molecules considered. Because of these small σ values, their values of q might be expected to be too large. Because of this we have only considered q values less than or equal to 0.1. In particular, we have examined convergence with respect to p for $q=0.1$, 0.05, and 0.01, the latter being a good lower limit based on reasonable estimates for an upper bound for σ. Our results for convergence with respect to p can be summarized as follows:

(1) Convergence is dependent on τ (due to the appearance of a factor τ^p in (10)).

(2) For $q=0.01$ convergence is obtained within table 1 over the entire range of T^* and τ values used.

(3) For $q=0.05$ convergence is obtained by the last term of table 1 for all T^* values included for $\tau \leqslant 2.0$. For this value of q and $\tau=3.0$, convergence is obtained only for $T^* \geqslant 0.5$ while for $\tau=4.0$ and $q=0.05$ table 1 is adequate only for $T^* > 0.75$.

(4) For $q=0.1$, there is convergence only for $\tau \leqslant 1$. For this value of q and $\tau=2$, the series converges within the table for $T^* \geqslant 0.75$. For $\tau=3.0$, and $q=0.1$, convergence is obtained only for $T^* \geqslant 1.0$ whereas for $\tau=4.0$ and $q=0.1$ convergence occurs only for $T^* \geqslant 2.0$.

Table 1 is clearly adequate for all except the most extreme cases. Sufficient terms are presented for almost all situations for substances with values of q less than 0.05. For $q=0.1$, the table is adequate for almost all situations for $\tau \leqslant 2.0$ and for many situations for τ even up to 3.0. It is clearly inadequate for the combination $\tau=4.0$, $q=0.1$.

For convenience to the user for those cases where table 1 is inadequate, a computer program for calculating the quantities Q_{lst} and α_{ip} (the latter to any order in p) has been included as appendix B. With the help of table 1 and/or appendix B it is possible to calculate $A_p(T^*, \tau)$ in (11) for as many values of p as are necessary for the proper evaluation of the second virial coefficient according to our model (i.e., according to eq (3)).

The tables were also compared with other published tables with particular emphasis placed on comparisons with those of Saxena et al. [11], for the (18, 6, 3) potential since those tables include functions of the first derivative of the second virial coefficients. In order to avoid the need for interpolation in the less closely spaced tables of Saxena et al., all comparisons were made for values of T^* and τ corresponding to values of y and t^* contained in [11]. Thus, comparisons were made for $y=0.4$ through 2.60 (y being defined as in reference [11]). For each such value of y the comparisons were made for $t^*=0.1$, in steps of 0.1, to 2.0 where such values were to be found in [11]. This corresponds, according to our definitions, to, approximately, $0.65 < T^* < 16$ and $0 < \tau < 3.6742$. It should be realized that this required the calculation of reduced second virial coefficients from our I_k tables.

Agreement to one part in ten thousand was obtained for all values of T^* greater than 2.0 and for all values of τ. Under those conditions, the major contributions to the second virial coefficients come from small values of k. For reduced temperatures smaller than 2.0, differences began to appear at the largest values of τ. These differences increased with decreasing T^* and reached a maximum of five parts in one thousand for the largest τ values at the two lowest temperatures, $T^*=0.65$ and 0.802. An examination of the contributions of successive terms showed that these differences could not be attributed to the possibility that Saxena et al. had included an insufficient number of terms in the evaluation of the second virial coefficient and its first derivative.

As mentioned above, the tables were also checked for accuracy and internal consistency by comparing the derivatives of the I_k calculated using a numerical difference scheme with the derivatives calculated using (18) and (19).

Because of these relatively large differences from the values published by Saxena et al., particular attention was paid to the lowest temperatures in this checking. It was a simple matter to carry out these comparisons for each value of m, for each k value and including many more T^* values than contained in these tables. Both the first and second derivatives were included in these comparisons.

It was found that the first derivatives calculated using differences and those calculated with (18) and (19) generally agreed to better than one part in 100,000 particularly for T^* small. At the higher T^* values, there were occasional differences on the order of one part in 10,000. As might be expected the differences between the derivatives calculated using the two methods were larger in the case of the second derivatives. Nevertheless, agreement was generally found to better than five parts in 100,000 with occasional high temperature values showing differences on the order of one part in 10,000 and with some rare cases where there were discrepancies on the order of five parts in 10,000.

Our tables would appear to be internally consistent to much better than the one part in 10,000 required indicating that the differences between our results and those of Saxena et al. are most likely attributable to errors in their calculations.

The tables of I_k values contained herein do not include all of the values which were computed. The values included represent an attempt to strike a compromise between the inclusion of a sufficient number of reduced temperatures to allow for ease in interpolation and the removal of a sufficient number of values to reduce the volume of numbers to manageable size. An attempt was made to include only those values such that the fourth tabular difference at any temperature divided by the value of the function at that temperature lie between 0.001 and 0.0001. It was possible to satisfy these limits for all reduced temperatures less than 4.0. This fraction took on values slightly above 0.001 in the range $4.0 < T^* < 4.5$ and $T^* > 11.0$ both of which represent quite high reduced temperatures for almost all polar substances. It follows then that a fourth order interpolation formula is guaranteed to produce errors less than one part per thousand over the entire set of tables. A sufficient number of decimal places has been included to allow for the use of still higher order interpolation formulas where necessary for additional accuracy.

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Appendix A. The Integration Over Angles

The angular integrals in (4) are of the form

$$Q_{lst}=\frac{(-1)^{l+s+t}}{16\pi^2}\int_0^{\pi}\sin\theta_1 d\theta_1\int_0^{\pi}\sin\theta_2 d\theta_2 \int_0^{2\pi}d\Phi_1\int_0^{2\pi}d\Phi_2\,\frac{X^lY^sZ^t}{l!s!t!} \qquad \text{A–1}$$

where l, s, and t are integers and where X, Y, and Z have already been defined. It should be noted that, for spherical molecules without dipole moments, $l=s=t=0$ whereas for the nonpolarizable dipole $l>0$ and $s=t=0$. The introduction of dipole polarizability requires s and/or t to be different from zero.

The integrand in A–1 is a function of the four angular variables. We choose to exhibit this explicitly by defining the function

$$G_{lst}(\theta_1,\theta_2,\Phi_1,\Phi_2)=\frac{X^lY^sZ^t}{l!s!t!}$$

Introducing the definitions of the functions X, Y, and Z, these become

$$G_{lst}(\theta_1,\theta_2,\Phi_1,\Phi_2)=(2\cos\theta_1\cos\theta_2+\sin\theta_1\sin\theta_2\cos(\Phi_1+\Phi_2))^l$$
$$(1-\frac{3}{2}\cos^2\theta_1-\frac{3}{2}\cos^2\theta_2)^s(8\cos\theta_1\cos\theta_2+\sin\theta_1\sin\theta_2\cos(\Phi_1+\Phi_2))^t\frac{1}{l!s!t!}.$$

On making use of the multinomial expansion, this can be written

$$G_{lst}(\theta_1,\theta_2,\Phi_1,\Phi_2)=\left\{\frac{1}{l!}\sum_{h=0}^{l}\binom{l}{h}2^{l-h}(\cos\theta_1\cos\theta_2)^{l-h}(\sin\theta_1\sin\theta_2)^h\cos^h(\Phi_1+\Phi_2)\right\}$$
$$\left\{\frac{1}{s!}\sum_{i=0}^{s}\binom{s}{i}\left(-\frac{3}{2}\right)^i\sum_{j=0}^{i}\binom{i}{j}(\cos\theta_1)^{2i-2j}(\cos\theta_2)^{2j}\right\}$$
$$\left\{\frac{1}{t!}\sum_{k=0}^{t}\binom{t}{k}8^{t-k}(\cos\theta_1\cos\theta_2)^{t-k}(\sin\theta_1\sin\theta_2\cos(\Phi_1+\Phi_2))^k\right\}$$

Equation A–1 then becomes

$$Q_{lst}=\sum_{h=0}^{l}\sum_{i=0}^{s}\sum_{j=0}^{i}\sum_{k=0}^{t}C_{\beta}^{\alpha}J_{hk}F_{v_1}F_{v_2} \qquad \text{A–2}$$

where the integrals F_{v_1} and F_{v_2} are defined by

$$F_w=\int_0^{\pi}(\cos\theta)^{w-h-k}(\sin\theta)^{h+k+1}d\theta \qquad \text{A–3}$$

the additional factor of $\sin\theta$ coming from the volume element in (2). It should be noted that since $h+k$ is even, and since $2i$ and $2j$ are necessarily even, both F_{v_1} and F_{v_2} vanish unless $l+t$ is even.

The integral in (A–3) can be evaluated by repeated integration by parts with the help of the identities

$$\int_0^{\pi}\cos^n X\sin^m X dX=\frac{m-1}{m+n}\int_0^{\pi}\cos^n X\sin^{m-2}X dX$$

and

$$\int_0^{\pi}\cos^p X\sin X dX=\frac{2}{p+1} \qquad p \text{ even}$$
$$=0 \qquad p \text{ odd}$$

There results

$$F_w=2^{h+k+1}\frac{\left(\frac{w}{2}\right)!(w-h-k)!\left(\frac{h+k}{2}\right)!}{(w+1)!\left(\frac{w-h-k}{2}\right)!}.$$

Making use of this result A–2 becomes

$$=\sum_{h=0}^{l}\sum_{i=0}^{s}\sum_{j=0}^{i}\sum_{k=0}^{t}\frac{2^{-h}}{16\pi^2}C_{hlst}^{ijk}(\cos\theta_1)^{v_1-h-k}\theta_1$$
$$(\cos\theta_2)^{v_2-h-k}(\sin\theta_1\sin\theta_2)^{h+k}(\cos(\Phi_1+\Phi_2))^{h+k}$$

where

$$v_1=l+t+2i-2j$$
$$v_2=l+t+2j$$

and

$$C_{hlst}^{ijk}=\binom{l}{h}\binom{s}{i}\binom{i}{j}\binom{t}{k}2^{(l-i+3t-2k)}\frac{(-3)^i}{l!s!t!}(-1)^{l+s+t}.$$

In what follows, we shall use the subscript β to refer to the set of subscripts $hlst$ and γ to refer to the superscripts ijk.

The integration over the azimuthal angles Φ_1 and Φ_2 can be simplified with the help of the transformation

$$\Phi_1+\Phi_2=\chi_1$$
$$\Phi_1=\chi_2.$$

There results the easily evaluated double integral

$$J_{hk}=\int_0^{2\pi}d\chi_2\int_0^{2\pi}d\chi_1\cos^{h+k}\chi_1$$
$$=2^{2-h-k}\pi^2\frac{(h+k)!}{\left[\frac{(h+k)!}{2}\right]^2} \text{ for } h+k \text{ even}$$

$$J_{hk}=0 \qquad h+k \text{ odd}$$

$$Q_{lst}=\frac{2^{-h}}{16\pi^2}\sum_{h=0}^{l}\sum_{i=0}^{s}\sum_{j=0}^{i}\sum_{k=0}^{t} C_{\beta}^{\alpha}\; 2^{2-h-2k}\pi^2 \frac{(h+k)!}{\left[\left(\frac{h+k}{2}\right)!\right]^2}$$

$$\times\left[2^{h+k+1}\frac{\left(\frac{v_1}{2}\right)!\;(v_1-h-k)!\left(\frac{h+k}{2}\right)!}{(v_1+1)!\left(\frac{v_1-h-k}{2}\right)!}\right]$$

$$\times\left[2^{h+k+1}\frac{\left(\frac{v_2}{2}\right)!\;(v_2-h-k)[\;\left(\frac{h+k}{2}\right)!}{(v_2+1)!\;\frac{(v_2-h-k)!}{2}}\right]$$

or

$$Q_{lst}=\sum_{h=0}^{l}\sum_{i=0}^{s}\sum_{j=0}^{i}\sum_{k=0}^{t} C_{\beta}^{\alpha}\frac{(h+k)!\;(v_1/2)!\;(v_2/2)!}{(v_1+1)!\;(v_2+1)!\left(\frac{v_1-h-k}{2}\right)!}\;\frac{(v_1-h-k)!\,(v_2-h-k)!}{\left(\frac{v_2-h-k}{2}\right)!}. \qquad \text{A-4}$$

Appendix B

```
      SUBROUTINE ALPHA(A,I,J)
      COMMON /FCTR/ FF
      DOUBLE PRECISION FF(50),F(49),X,A ,Q
      EQUIVALENCE (FF(2),F(1))
      IP=I+J+1
      X=0.D0
      DO 10 KK=1,IP
      K=KK-1
   10 X=X+F(2*K)/(F(K)*F(K))
      X=F(2*IP-1)**2/(4.D0**(I+J)*F(IP-1)**2*X)
      A=0.D0
      LS=J+1
      DO 30 LL=1,LS
      IS=LL-1
      DO 30 LT=1,LS
      IT=LT-1
      IF((IS+2*IT).NE.J) GO TO 30
      L=2*I+MOD(IT,2)
      A=A+Q(L,IS,IT)
   30 CONTINUE
      A=A*X
      RETURN
      END

      FUNCTION Q(L,S,T)
      INTEGER S,T,V,W,H
      COMMON /FCTR/ FF
      DOUBLE PRECISION FF(50),Q,F(49),C,A
      EQUIVALENCE (FF(2),F(1))
      Q=0.D0
      LL=L+1
      LS=S+1
      LT=T+1
      DO 80 IH=1,LL
      H=IH-1
      DO 80 II=1,LS
      I=II-1
      DO 80 IJ=1,II
      J=IJ-1
      DO 80 IK=1,LT
      K=IK-1
      KH=H+K
```

```
      IF(MOD(KH,2).NE.0) GO TO 80
      V=(L+T+2*I-2*J)/2
      W=(L+T+2*J)/2
      A=C(F,I,J,K,H,L,S,T)*2.D0**K *F(KH)
      A=A*F(V)*F(W)/(F(2*V+1)*F(2*W+1))
      KV=V-KH/2
      KW=W-KH/2
      A=A*F(2*KV)*F(2*KW)/(F(KV)*F(KW))
      Q=Q+A
   80 CONTINUE
      WRITE(6,99) L,S,T,Q,I,J,K,H,V,W,A
   99 FORMAT(4X,3I5,D25.15,6I5,D25.15)
      RETURN
      END

      FUNCTION C(F,I,J,K,IH,L,M,N)
      DOUBLE PRECISION C,F(49)
      C=(-3.D0)**I*2.D0**(L   -I+3*N-3*K) *(-1.D0)**M
      LI=L-IH
      MI=M-I
      IJ=I-J
      NK=N-K
      C=C/(F(IH)*F(LI)*F(MI)*F(J)*F(IJ)*F(K)*F(NK))
      RETURN
      END


      SUBROUTINE FAC
      COMMON /FCTR/ F
      DOUBLE PRECISION F(80)
      F(1)=1.D0
      DO 10 I=2,80
      X=I-1
   10 F(I) = F(I-1) * X
      RETURN
      END


      FUNCTION FACT(I)
      COMMON /FCTR/ F(60)
      DOUBLE PRECISION SUM,F,FACT
      SUM = 0.
      I1=I+1
      DO 10 JJ=1,I1
      J=JJ-1
   10 SUM = SUM + F(2*J+1)/F(J+1)**2
      FACT = 4.D0**I*SUM*(F(I+1)/F(2*I+2))**2
      RETURN
      END
```

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TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*

$m=9$

T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$	T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$
.300	−35.02383	95.03544	−441.53292	1.500	−1.76949	3.04686	−7.30858
.305	−33.49930	89.51898	−411.00451	1.550	−1.67183	2.91081	−6.95003
.310	−32.08515	84.47750	−383.39190	1.600	−1.58142	2.78581	−6.62337
.315	−30.77079	79.85993	−358.35783	1.650	−1.49748	2.67057	−6.32463
.320	−29.54683	75.62140	−335.60807	1.700	−1.41936	2.56401	−6.05045
.325	−28.40491	71.72246	−314.88603	1.750	−1.34648	2.46520	−5.79800
.330	−27.33762	68.12842	−295.96795	1.800	−1.27833	2.37331	−5.56486
.335	−26.33835	64.80877	−278.65859	1.850	−1.21449	2.28767	−5.34893
.340	−25.40121	61.73662	−262.78743	1.900	−1.15455	2.20765	−5.14841
.345	−24.52094	58.88826	−248.20528	2.000	−1.04509	2.06243	−4.78756
.350	−23.69283	56.24269	−234.78135	2.100	−.94763	1.93410	−4.47204
.360	−22.17665	51.48757	−210.96160	2.200	−.86034	1.81990	−4.19395
.370	−20.82369	47.34560	−190.56018	2.300	−.78174	1.71763	−3.94708
.380	−19.61030	43.71629	−172.97251	2.400	−.71062	1.62551	−3.72651
.390	−18.51697	40.51853	−157.71741	2.500	−.64598	1.54211	−3.52832
.400	−17.52753	37.68635	−144.40919	2.600	−.58700	1.46626	−3.34928
.410	−16.56525	35.21820	−132.67749	2.700	−.53298	1.39697	−3.18678
.420	−15.80865	32.91327	−122.45387	2.800	−.48334	1.33343	−3.03865
.430	−15.06465	30.88332	−113.35011	2.900	−.43758	1.27495	−2.90307
.440	−14.36934	29.06873	−105.24893	3.000	−.39528	1.22097	−2.77853
.450	−13.73356	27.42187	−98.01626	3.100	−.35607	1.17096	−2.66375
.460	−13.14882	25.92441	−91.53557	3.200	−.31964	1.12453	−2.55761
.470	−12.60641	24.56175	−85.70413	3.300	−.28570	1.08128	−2.45921
.480	−12.10223	23.31776	−80.43915	3.400	−.25403	1.04092	−2.36771
.490	−11.63326	22.17792	−75.67087	3.500	−.22441	1.00315	−2.28242
.500	−11.19594	21.13078	−71.33917	3.600	−.19665	.96774	−2.20273
.510	−10.78714	20.16642	−67.39226	3.700	−.17059	.93447	−2.12811
.520	−10.40427	19.27607	−63.78611	3.800	−.14609	.90316	−2.05809
.530	−10.04502	18.45213	−60.48263	3.900	−.12302	.87363	−1.99227
.540	−9.70732	17.68794	−57.44885	4.000	−.10125	.84575	−1.93027
.550	−9.38934	16.97768	−54.65614	4.250	−.05192	.78242	−1.78999
.560	−9.08944	16.31621	−52.07950	4.500	−.00881	.72670	−1.66751
.580	−8.53818	15.12204	−47.48972	4.750	.01469	.67744	−1.55966
.600	−8.04357	14.07499	−43.53455	5.000	.06274	.63353	−1.46398
.620	−7.59742	13.15092	−40.10097	5.250	.09268	.59415	−1.37850
.640	−7.19311	12.33052	−37.10002	5.500	.11949	.55863	−1.30170
.660	−6.82509	11.59815	−34.46082	5.750	.14360	.52643	−1.23229
.680	−6.48879	10.94106	−32.12645	6.000	.16537	.49712	−1.16928
.700	−6.18032	10.34878	−30.05075	6.250	.18511	.47031	−1.11181
.720	−5.89642	9.81260	−28.19598	6.500	.20308	.44571	−1.05918
.740	−5.63432	9.32527	−26.53105	6.750	.21946	.42304	−1.01081
.760	−5.39162	8.88069	−25.03020	7.000	.23447	.40209	−.96620
.780	−5.16628	8.47371	−23.67190	7.250	.24823	.38268	−.92492
.800	−4.95652	8.09995	−22.43807	7.500	.26090	.36465	−.88662
.820	−4.76080	7.75565	−21.31342	7.750	.27258	.34784	−.85099
.840	−4.57778	7.43760	−20.28496	8.000	.28337	.33215	−.81775
.860	−4.40626	7.14301	−19.34161	8.250	.29337	.31746	−.78667
.880	−4.24522	6.86948	−18.47383	8.500	.30264	.30368	−.75756
.900	−4.09371	6.61488	−17.67341	9.000	.31927	.27855	−.70451
.920	−3.95097	6.37741	−16.93328	9.500	.33372	.25619	−.65739
.940	−3.81622	6.15543	−16.24721	10.000	.34634	.23619	−.61527
.960	−3.68883	5.94753	−15.60982	10.500	.35742	.21818	−.57740
.980	−3.56822	5.75244	−15.01638	11.000	.36719	.20189	−.54315
1.000	−3.45387	5.56906	−14.46272	11.500	.37583	.18709	−.51204
1.025	−3.31897	5.35484	−13.82190	12.000	.38351	.17358	−.48365
1.050	−3.19241	5.15554	−13.22959	12.500	.39034	.16120	−.45765
1.075	−3.07330	4.96978	−12.68253	13.000	.39643	.14982	−.43374
1.100	−2.96105	4.79638	−12.17645	13.500	.40189	.13932	−.41168
1.150	−2.75493	4.48175	−11.26809	14.000	.40678	.12961	−.39127
1.200	−2.57017	4.20403	−10.47769	15.000	.41511	.11223	−.35470
1.250	−2.40360	3.95717	−9.78448	16.000	.42186	.09713	−.32288
1.300	−2.25283	3.73642	−9.17220	17.000	.42735	.08389	−.29496
1.350	−2.11558	3.53788	−8.62791	18.000	.43180	.07220	−.27026
1.400	−1.99024	3.35843	−8.14123	19.000	.43542	.06181	−.24825
1.450	−1.87527	3.19547	−7.70376	20.000	.43835	.05252	−.22853

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=9$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
.300	4.74342	41.16584	−196.6320	1272.544	2.275951+01	−1.557715+02	1.297592+03
.305	4.70438	38.05780	−179.7159	1152.507	2.033421+01	−1.380636+02	1.141989+03
.310	4.66628	35.26002	−164.6504	1046.518	1.821655+01	−1.227242+02	1.008138+03
.315	4.62910	32.73492	−151.1948	952.6499	1.636175+01	−1.093927+02	8.926015+02
.320	4.59279	30.45021	−139.1444	869.2750	1.473235+01	−9.776955+01	7.925412+02
.325	4.55733	28.37804	−128.3244	795.0145	1.329684+01	−8.760514+01	7.056078+02
.330	4.52267	26.49430	−118.5846	728.6952	1.202868+01	−7.869042+01	6.298477+02
.335	4.48879	24.77807	−109.7963	669.3161	1.090540+01	−7.084982+01	5.636304+02
.340	4.45566	23.21113	−101.8481	616.0196	9.907907+00	−6.393529+01	5.055896+02
.345	4.42326	21.77758	−94.64379	568.0693	9.019952+00	−5.782163+01	4.545768+02
.350	4.39155	20.46349	−88.09971	524.8303	8.227641+00	−5.240254+01	4.096231+02
.360	4.33013	18.14623	−76.71063	450.3649	6.883986+00	−4.329929+01	3.347364+02
.370	4.27121	16.17794	−67.20218	389.0477	5.800208+00	−3.604769+01	2.757344+02
.380	4.21464	14.49494	−59.20609	338.1643	4.918997+00	−3.022166+01	2.288290+02
.390	4.16025	13.04697	−52.43624	295.6331	4.197100+00	−2.550351+01	1.912267+02
.400	4.10792	11.79402	−46.66835	259.8423	3.601554+00	−2.165400+01	1.608452+02
.410	4.05751	10.70397	−41.72505	229.5328	3.107005+00	−1.849120+01	1.361168+02
.420	4.00892	9.750872	−37.46498	203.7127	2.693782+00	−1.587550+01	1.158503+02
.430	3.96203	8.913570	−33.77462	181.5943	2.346502+00	−1.369889+01	9.913255+01
.440	3.91675	8.174732	−30.56216	162.5475	2.053043+00	−1.187709+01	8.525746+01
.450	3.87298	7.520055	−27.75283	146.0647	1.803782+00	−1.034388+01	7.367505+01
.460	3.83065	6.937671	−25.28539	131.7342	1.591027+00	−9.046851+00	6.395361+01
.470	3.78968	6.417676	−23.10936	119.2202	1.408594+00	−7.944222+00	5.575194+01
.480	3.75000	5.951758	−21.18288	108.2469	1.251476+00	−7.002495+00	4.879854+01
.490	3.71154	5.532912	−19.47109	98.58659	1.115600+00	−6.194639+00	4.287603+01
.500	3.67423	5.155199	−17.94477	90.05044	9.976294−01	−5.498719+00	3.780930+01
.510	3.63803	4.813568	−16.57935	82.48085	8.948223−01	−4.896834+00	3.345652+01
.520	3.60288	4.503699	−15.35404	75.74570	8.049101−01	−4.374305+00	2.970214+01
.530	3.56873	4.221884	−14.25118	69.73379	7.260080−01	−3.919029+00	2.645158+01
.540	3.53553	3.964931	−13.25572	64.35104	6.565438−01	−3.520983+00	2.362701+01
.550	3.50325	3.730076	−12.35479	59.51758	5.951994−01	−3.171829+00	2.116412+01
.560	3.47183	3.514921	−11.53729	55.16529	5.408657−01	−2.864597+00	1.900947+01
.580	3.41144	3.135627	−10.11571	47.67921	4.496239−01	−2.353440+00	1.545399+01
.600	3.35410	2.813284	−8.928811	41.51735	3.768893−01	−1.950862+00	1.268357+01
.620	3.29956	2.537263	−7.929473	36.39905	3.183399−01	−1.630494+00	1.050117+01
.640	3.24760	2.299262	−7.081512	32.11181	2.707841−01	−1.373099+00	8.764601+00
.660	3.19801	2.092730	−6.356843	28.49285	2.318351−01	−1.164463+00	7.369866+00
.680	3.15063	1.912447	−5.733442	25.41612	1.996887−01	−9.939583−01	6.239977+00
.700	3.10529	1.754215	−5.193872	22.78300	1.729660−01	−8.535507−01	5.317278+00
.720	3.06186	1.614634	−4.724203	20.51564	1.506035−01	−7.371047−01	4.558132+00
.740	3.02020	1.490923	−4.313216	18.55203	1.317726−01	−6.398894−01	3.929183+00
.760	2.98020	1.380796	−3.951805	16.84237	1.158230−01	−5.582250−01	3.404695+00
.780	2.94174	1.282359	−3.632523	15.34638	1.022399−01	−4.892244−01	2.964641+00
.800	2.90474	1.194032	−3.349242	14.03120	9.061252−02	−4.306052−01	2.593305+00
.820	2.86910	1.114493	−3.096885	12.86991	8.061122−02	−3.805494−01	2.278262+00
.840	2.83473	1.042623	−2.871222	11.84026	7.196932−02	−3.375992−01	2.009619+00
.860	2.80158	.9774777	−2.668707	10.92379	6.446993−02	−3.005775−01	1.779440+00
.880	2.76956	.9182495	−2.486117	10.10442	5.793551−02	−2.685280−01	1.581324+00
.900	2.73861	.8642490	−2.321627	9.371097	5.221998−02	−2.406698−01	1.410072+00
.920	2.70868	.8148829	−2.172381	8.710998	4.720247−02	−2.163609−01	1.261439+00
.940	2.67971	.7696391	−2.036773	8.115483	4.278246−02	−1.950712−01	1.131941+00
.960	2.65165	.7280740	−1.913225	7.576656	3.887600−02	−1.763606−01	1.018699+00
.980	2.62445	.6898014	−1.800376	7.087762	3.541260−02	−1.598621−01	9.193291−01
1.000	2.59808	.6544843	−1.697048	6.643000	3.233285−02	−1.452682−01	8.318416−01
1.025	2.56620	.6140476	−1.579734	6.141554	2.894680−02	−1.293139−01	7.366824−01
1.050	2.53546	.5772706	−1.473997	5.692978	2.600020−02	−1.155149−01	6.548271−01
1.075	2.50581	.5437257	−1.378386	5.290289	2.342580−02	−1.035297−01	5.841035−01
1.100	2.47717	.5130462	−1.291669	4.927597	2.116808−02	−9.307822−02	5.227419−01
1.150	2.42272	.4590593	−1.140851	4.302962	1.742620−02	−7.589308−02	4.225573−01
1.200	2.37171	.4132469	−1.014767	3.787273	1.448989−02	−6.254442−02	3.454438−01
1.250	2.32379	.3740391	−.9083500	3.357085	1.215793−02	−5.204352−02	2.852950−01
1.300	2.27866	.3402245	−.8177530	2.994839	1.028563−02	−4.368723−02	2.378099−01
1.350	2.23607	.3108563	−.7400177	2.687194	8.767360−03	−3.696740−02	1.999084−01
1.400	2.19578	.2851868	−.6728405	2.423887	7.524919−03	−3.151141−02	1.693509−01
1.450	2.15758	.2626185	−.6144066	2.196922	6.499647−03	−2.704232−02	1.444860−01

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for* $(m, 6, 3)$ *potential function* — Continued

$m=9$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
1.50	2.12132	.2426699	−.5632725	2.000004	5.647029−03	−2.335172−02	1.240807−01
1.55	2.08683	.2249493	−.5182783	1.828130	4.932911−03	−2.028102−02	1.072031−01
1.60	2.05396	.2091357	−.4784841	1.677280	4.330820−03	−1.770824−02	9.314162−02
1.65	2.02260	.1949637	−.4431223	1.544204	3.820048−03	−1.553865−02	8.134685−02
1.70	1.99263	.1822127	−.4115609	1.426246	3.384251−03	−1.369799−02	7.139100−02
1.75	1.96396	.1706979	−.3832760	1.321226	3.010423−03	−1.212758−02	6.293788−02
1.80	1.93649	.1602636	−.3578307	1.227338	2.688138−03	−1.078065−02	5.572116−02
1.85	1.91014	.1507780	−.3348581	1.143076	2.408979−03	−9.619685−03	4.952818−02
1.90	1.88484	.1421287	−.3140484	1.067181	2.166100−03	−8.614351−03	4.418797−02
2.00	1.83712	.1269678	−.2779049	.9364011	1.767786−03	−6.976355−03	3.553787−02
2.10	1.79284	.1141605	−.2477223	.8282741	1.459170−03	−5.717743−03	2.894065−02
2.20	1.75162	.1032404	−.2222581	.7378838	1.216743−03	−4.736638−03	2.383335−02
2.30	1.71312	.09385154	−.2005767	.6615707	1.023941−03	−3.961903−03	1.982607−02
2.40	1.67705	.08571814	−.1819632	.5965679	8.688800−04	−3.342941−03	1.664346−02
2.50	1.64317	.07862413	−.1658636	.5407526	7.428988−04	−2.843158−03	1.408786−02
2.60	1.61126	.07239814	−.1518436	.4924767	6.395899−04	−2.435703−03	1.201521−02
2.70	1.58114	.06690282	−.1395585	.4504420	5.541501−04	−2.100537−03	1.031853−02
2.80	1.55265	.06202708	−.1287325	.4136189	4.829345−04	−1.822595−03	8.917958−03
2.90	1.52564	.05768024	−.1191423	.3811807	4.231483−04	−1.590371−03	7.752812−03
3.00	1.50000	.05378771	−.1106063	.3524601	3.726239−04	−1.395025−03	6.776655−03
3.10	1.47561	.05028764	−.1029738	.3269058	3.296524−04	−1.229594−03	5.953192−03
3.20	1.45237	.04712843	−.09612128	.3040700	2.928983−04	−1.088675−03	5.254311−03
3.30	1.43019	.04426672	−.08994536	.2835797	2.612927−04	−9.679661−04	4.657740−03
3.40	1.40900	.04166611	−.08435977	.2651252	2.339778−04	−8.640292−04	4.145757−03
3.50	1.38873	.03929512	−.07929017	.2484422	2.102598−04	−7.740966−04	3.704153−03
3.60	1.36931	.03712715	−.07467484	.2333116	1.895740−04	−6.959248−04	3.321454−03
3.70	1.35068	.03513947	−.07046067	.2195458	1.714579−04	−6.276832−04	2.988330−03
3.80	1.33278	.03331237	−.06660213	.2069848	1.555299−04	−5.678688−04	2.697145−03
3.90	1.31559	.03162880	−.06305997	.1954916	1.414742−04	−5.152404−04	2.441618−03
4.00	1.29904	.03007391	−.05980024	.1849478	1.290273−04	−4.687674−04	2.216548−03
4.25	1.26025	.02666853	−.05270202	.1621037	1.035855−04	−3.742048−04	1.760427−03
4.50	1.22474	.02382761	−.04682596	.1433204	8.430543−05	−3.029863−04	1.418802−03
4.75	1.19208	.02143152	−.04190451	.1276847	6.944910−05	−2.484175−04	1.158359−03
5.00	1.16189	.01939088	−.03773977	.1145267	5.783074−05	−2.059623−04	9.566670−04
5.25	1.13389	.01763784	−.03418276	.1033459	4.862338−05	−1.724775−04	7.982664−04
5.50	1.10782	.01612008	−.03111962	.09376251	4.123947−05	−1.457423−04	6.722922−04
5.75	1.08347	.01479675	−.02846206	.08548385	3.525382−05	−1.241585−04	5.709620−04
6.00	1.06066	.01363555	−.02614074	.07828154	3.035400−05	−1.065575−04	4.886108−04
6.25	1.03923	.01261066	−.02410064	.07197523	2.630713−05	−9.207226−05	4.210531−04
6.50	1.01905	.01170126	−.02229759	.06642095	2.293736−05	−8.005091−05	3.651536−04
6.75	1.00000	.01089036	−.02069581	.06150264	2.011027−05	−6.999722−05	3.185346−04
7.00	.98198	.01016403	−.01926605	.05712584	1.772199−05	−6.152920−05	2.793718−04
7.25	.96490	.009510715	−.01798425	.05321312	1.569148−05	−5.434982−05	2.462513−04
7.50	.94868	.008920805	−.01683041	.04970045	1.395486−05	−4.822581−05	2.180661−04
7.75	.93326	.008386222	−.01578783	.04653451	1.246136−05	−4.297238−05	1.939416−04
8.00	.91856	.007900147	−.01484246	.04367064	1.117033−05	−3.844194−05	1.731812−04
8.25	.90453	.007456790	−.01398243	.04107117	1.004892−05	−3.451569−05	1.552257−04
8.50	.89113	.007051205	−.01319761	.03870416	9.070452−06	−3.109731−05	1.396229−04
9.00	.86603	.006336966	−.01182029	.03456247	7.458836−06	−2.548375−05	1.140683−04
9.50	.84293	.005729951	−.01065476	.03107067	6.202596−06	−2.112461−05	9.429075−05
10.00	.82158	.005209400	−.009659161	.02809808	5.209746−06	−1.769142−05	7.876232−05
10.50	.80178	.004759386	−.008801569	.02554548	4.415287−06	−1.495307−05	6.641197−05
11.00	.78335	.004367513	−.008057256	.02333638	3.772447−06	−1.274393−05	5.647469−05
11.50	.76613	.004024020	−.007406837	.02141107	3.247012−06	−1.094326−05	4.839469−05
12.00	.75000	.003721126	−.006834932	.01972232	2.813576−06	−9.461710−06	4.176188−05
12.50	.73485	.003452570	−.006329209	.01823240	2.453016−06	−8.232255−06	3.626946−05
13.00	.72058	.003213261	−.005879683	.01691087	2.150762−06	−7.203960−06	3.168493−05
13.50	.70711	.002999028	−.005478200	.01573294	1.895584−06	−6.337682−06	2.783004−05
14.00	.69437	.002806424	−.005118042	.01467824	1.678735−06	−5.603014−06	2.456665−05
15.00	.67082	.002475095	−.004500329	.01287392	1.333937−06	−4.438076−06	1.940454−05
16.00	.64952	.002201394	−.003991941	.01139362	1.076507−06	−3.571325−06	1.557546−05
17.00	.63013	.001972476	−.003568156	.01016317	8.806125−07	−2.913825−06	1.267880−05
18.00	.61237	.001778920	−.003210915	.009128588	7.290302−07	−2.406506−06	1.044939−05
19.00	.59604	.001613677	−.002906770	.008249831	6.099869−07	−2.009132−06	8.707139−06
20.00	.58095	.001471387	−.002645533	.007496661	5.152557−07	−1.693675−06	7.326975−06

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m=9$

T^*	I_3	$T^* \frac{\partial I_3}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_3}{\partial T^{*2}}$	T^*	I_3	$T^* \frac{\partial I_3}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_3}{\partial T^{*2}}$
.300	8.523708+00	−7.423520+01	7.500989+02	1.500	1.249069−04	−7.225655−04	5.009967−03
.305	7.384336+00	−6.389539+01	6.417862+02	1.550	1.033730−04	−5.951148−04	4.107934−03
.310	6.418004+00	−5.518305+01	5.510661+02	1.600	8.614117−05	−4.936434−04	3.393121−03
.315	5.595476+00	−4.781441+01	4.747840+02	1.650	7.224271−05	−4.121957−04	2.821909−03
.320	4.892929+00	−4.155968+01	4.104013+02	1.700	6.094996−05	−3.463217−04	2.361872−03
.325	4.290866+00	−3.623205+01	3.558658+02	1.750	5.171100−05	−2.926641−04	1.988658−03
.330	3.773263+00	−3.167892+01	3.095109+02	1.800	4.410336−05	−2.486655−04	1.683804−03
.335	3.326903+00	−2.777519+01	2.699780+02	1.850	3.780092−05	−2.123612−04	1.433186−03
.340	2.940837+00	−2.441788+01	2.361546+02	1.900	3.254987−05	−1.822291−04	1.225909−03
.345	2.605969+00	−2.152190+01	2.071264+02	2.000	2.444793−05	−1.359828−04	9.093255−04
.350	2.314707+00	−1.901665+01	1.821392+02	2.100	1.865255−05	−1.031267−04	6.858086−04
.360	1.838617+00	−1.495314+01	1.418950+02	2.200	1.443269−05	−7.935276−05	5.250091−04
.370	1.472943+00	−1.186365+01	1.115810+02	2.300	1.131041−05	−6.186537−05	4.073648−04
.380	1.189416+00	−9.491467+00	8.851227+01	2.400	8.966457−06	−4.880821−05	3.199616−04
.390	9.676377−01	−7.653213+00	7.078841+01	2.500	7.183423−06	−3.892611−05	2.541205−04
.400	7.927207−01	−6.216368+00	5.704846+01	2.600	5.810765−06	−3.135472−05	2.038942−04
.410	6.536890−01	−5.084142+00	4.630692+01	2.700	4.742128−06	−2.548622−05	1.651252−04
.420	5.423714−01	−4.185131+00	3.784270+01	2.800	3.901650−06	−2.089037−05	1.348811−04
.430	4.526288−01	−3.466154+00	3.112310+01	2.900	3.234411−06	−1.725635−05	1.110539−04
.440	3.798089−01	−2.887251+00	2.575083+01	3.000	2.700075−06	−1.435711−05	9.211023−05
.450	3.203574−01	−2.418140+00	2.142711+01	3.100	2.268695−06	−1.202486−05	7.692120−05
.460	2.715377−01	−2.035688+00	1.792533+01	3.200	1.917806−06	−1.013421−05	6.464645−05
.470	2.312277−01	−1.722094+00	1.507228+01	3.300	1.630378−06	−8.590496−06	5.465377−05
.480	1.977701−01	−1.463555+00	1.273460+01	3.400	1.393381−06	−7.321550−06	4.646287−05
.490	1.698621−01	−1.249303+00	1.080889+01	3.500	1.196760−06	−6.271879−06	3.970560−05
.500	1.464733−01	−1.070874+00	9.214423+00	3.600	1.032692−06	−5.398444−06	3.409730−05
.510	1.267839−01	−9.215833−01	7.887792+00	3.700	8.950390−07	−4.667604−06	2.941614−05
.520	1.101376−01	−7.961128−01	6.778880+00	3.800	7.789555−07	−4.052864−06	2.548790−05
.530	9.600659−02	−6.902125−01	5.847853+00	3.900	6.805864−07	−3.533219−06	2.217483−05
.540	8.396407−02	−6.004658−01	5.062871+00	4.000	5.968460−07	−3.091899−06	1.936723−05
.550	7.366304−02	−5.241127−01	4.398350+00	4.250	4.363235−07	−2.249111−06	1.402403−05
.560	6.482022−02	−4.589126−01	3.833631+00	4.500	3.251938−07	−1.668682−06	1.036167−05
.580	5.062072−02	−3.549909−01	2.939638+00	4.750	2.465496−07	−1.259876−06	7.793433−06
.600	3.995235−02	−2.776671−01	2.280355+00	5.000	1.897974−07	−9.661575−07	5.955586−06
.620	3.184152−02	−2.194189−01	1.787893+00	5.250	1.481218−07	−7.513373−07	4.616379−06
.640	2.560730−02	−1.750372−01	1.415663+00	5.500	1.170329−07	−5.916871−07	3.624510−06
.660	2.076666−02	−1.408617−01	1.131211+00	5.750	9.350976−08	−4.713092−07	2.879009−06
.680	1.697253−02	−1.142858−01	9.116147−01	6.000	7.547982−08	−3.793425−07	2.311150−06
.700	1.397246−02	−9.342996−02	7.404734−01	6.250	6.149659−08	−3.082342−07	1.873304−06
.720	1.158077−02	−7.692287−02	6.059114−01	6.500	5.053413−08	−2.526466−07	1.531920−06
.740	9.659428−03	−6.375315−02	4.992326−01	6.750	4.185416−08	−2.087514−07	1.263005−06
.760	8.104817−03	−5.316729−02	4.140022−01	7.000	3.491825−08	−1.737651−07	1.049165−06
.780	6.838434−03	−4.459845−02	3.454114−01	7.250	2.932881−08	−1.456385−07	8.776283−07
.800	5.800278−03	−3.761640−02	2.898331−01	7.500	2.478890−08	−1.228452−07	7.389070−07
.820	4.944119−03	−3.189183−02	2.445081−01	7.750	2.107438−08	−1.042362−07	6.258747−07
.840	4.234059−03	−2.717066−02	2.073197−01	8.000	1.801437−08	−8.893771−08	5.331248−07
.860	3.642019−03	−2.325539−02	1.766319−01	8.250	1.547741−08	−7.627908−08	4.565164−07
.880	3.145885−03	−1.999137−02	1.511704−01	8.500	1.336150−08	−6.574104−08	3.928501−07
.900	2.728128−03	−1.725671−02	1.299364−01	9.000	1.009045−08	−4.949180−08	2.949086−07
.920	2.374765−03	−1.495473−02	1.121412−01	9.500	7.742942−09	−3.786869−08	2.250603−07
.940	2.074578−03	−1.300827−02	9.715880−02	10.000	6.027027−09	−2.939845−08	1.742991−07
.960	1.818516−03	−1.135539−02	8.448876−02	10.500	4.751976−09	−2.312206−08	1.367810−07
.980	1.599236−03	−9.946105−03	7.372917−02	11.000	3.790373−09	−1.840091−08	1.086263−07
1.000	1.410754−03	−8.739846−03	6.455533−02	11.500	3.055363−09	−1.480101−08	8.720551−08
1.025	1.211075−03	−7.467739−03	5.492115−02	12.000	2.486647−09	−1.202188−08	7.070253−08
1.050	1.044202−03	−6.409839−03	4.694536−02	12.500	2.041663−09	−9.852006−09	5.784234−08
1.075	9.040446−04	−5.525498−03	4.030698−02	13.000	1.689908−09	−8.140175−09	4.771522−08
1.100	7.857674−04	−4.782598−03	3.475365−02	13.500	1.409217−09	−6.776753−09	3.966305−08
1.150	6.001468−04	−3.624074−03	2.614369−02	14.000	1.183274−09	−5.681219−09	3.320343−08
1.200	4.645734−04	−2.784819−03	1.995335−02	15.000	8.500320−10	−4.069306−09	2.371978−08
1.250	3.640391−04	−2.167218−03	1.542991−02	16.000	6.243580−10	−2.981041−09	1.733471−08
1.300	2.884509−04	−1.706184−03	1.207539−02	17.000	4.676023−10	−2.227216−09	1.292298−08
1.350	2.308963−04	−1.357498−03	9.554010−03	18.000	3.562639−10	−1.693155−09	9.804561−09
1.400	1.865624−04	−1.090605−03	7.635304−03	19.000	2.756077−10	−1.307167−09	7.555499−09
1.450	1.520459−04	−8.840533−04	6.158546−03	20.000	2.161412−10	−1.023196−09	5.904069−09

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m=12$

T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$	T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$
.300	−27.88058	76.60725	−356.87677	1.500	−1.20088	2.41414	−5.80691
.305	−26.65829	72.17876	−332.37589	1.550	−1.12352	2.30567	−5.52061
.310	−25.51878	68.10205	−310.01275	1.600	−1.05191	2.20602	−5.25985
.315	−24.45686	64.35313	−289.63388	1.650	−.98545	2.11418	−5.02143
.320	−23.46734	60.90802	−271.08578	1.700	−.92362	2.02926	−4.80267
.325	−22.54504	57.74275	−254.21500	1.750	−.86594	1.95053	−4.60129
.330	−21.68477	54.83334	−238.86804	1.800	−.81203	1.87733	−4.41535
.335	−20.88134	52.15582	−224.89144	1.850	−.76154	1.80911	−4.24317
.340	−20.12957	49.68620	−212.13170	1.900	−.71415	1.74537	−4.08331
.345	−19.41961	47.37721	−200.27843	2.000	−.62763	1.62972	−3.79571
.350	−18.75279	45.23749	−189.39784	2.100	−.55063	1.52755	−3.54433
.360	−17.53534	41.40722	−170.19200	2.200	−.48171	1.43663	−3.32284
.370	−16.44618	38.05678	−153.64931	2.300	−.41968	1.35522	−3.12626
.380	−15.47213	35.13298	−139.46209	2.400	−.36358	1.28190	−2.95068
.390	−14.59278	32.54850	−127.10256	2.500	−.31261	1.21553	−2.79294
.400	−13.79883	30.26708	−116.36602	2.600	−.26613	1.15517	−2.65048
.410	−13.07640	28.23177	−106.91833	2.700	−.22359	1.10004	−2.52120
.420	−12.41877	26.41727	−98.62002	2.800	−.18451	1.04948	−2.40337
.430	−11.81624	24.78531	−91.25262	2.900	−.14850	1.00296	−2.29555
.440	−11.26387	23.31785	−84.71897	3.000	−.11523	.96000	−2.19653
.450	−10.75472	21.98847	−78.87212	3.100	−.08441	.92022	−2.10527
.460	−10.28508	20.78407	−73.64303	3.200	−.05579	.88328	−2.02090
.470	−9.84986	19.68598	−68.93034	3.300	−.02914	.84887	−1.94268
.480	−9.44623	18.68450	−64.68407	3.400	−.00428	.81676	−1.86996
.490	−9.07046	17.76639	−60.83397	3.500	.01896	.78671	−1.80218
.500	−8.72020	16.92369	−57.33951	3.600	.04072	.75854	−1.73886
.510	−8.39283	16.14750	−54.15482	3.700	.06114	.73208	−1.67957
.520	−8.08631	15.43102	−51.24558	3.800	.08033	.70716	−1.62395
.530	−7.79875	14.76810	−48.58097	3.900	.09839	.68367	−1.57165
.540	−7.52850	14.15338	−46.13431	4.000	.11542	.66148	−1.52240
.550	−7.27408	13.58215	−43.88243	4.250	.15397	.61105	−1.41097
.560	−7.03419	13.05026	−41.80512	4.500	.18762	.56675	−1.31370
.580	−6.59336	12.09027	−38.10566	4.750	.21719	.52755	−1.22806
.600	−6.19797	11.24885	−34.90536	5.000	.24334	.49260	−1.15207
.620	−5.84148	10.50651	−32.13996	5.250	.26660	.46124	−1.08420
.640	−5.51852	9.84766	−29.72374	5.500	.28739	.43296	−1.02321
.660	−5.22466	9.25970	−27.59943	5.750	.30607	.40732	−.96810
.680	−4.95620	8.73234	−25.72102	6.000	.32290	.38397	−.91806
.700	−4.71004	8.25712	−24.05124	6.250	.33814	.36262	−.87242
.720	−4.48356	7.82704	−22.55959	6.500	.35197	.34301	−.83063
.740	−4.27452	7.43624	−21.22100	6.750	.36457	.32495	−.79221
.760	−4.08101	7.07983	−20.01463	7.000	.37609	.30826	−.75679
.780	−3.90139	6.75364	−18.92313	7.250	.38663	.29278	−.72400
.800	−3.73423	6.45414	−17.93190	7.500	.39631	.27840	−.69358
.820	−3.57830	6.17832	−17.02860	7.750	.40522	.26500	−.66528
.840	−3.43251	5.92358	−16.20277	8.000	.41343	.25248	−.63888
.860	−3.29592	5.68769	−15.44544	8.250	.42102	.24076	−.61419
.880	−3.16771	5.46870	−14.74896	8.500	.42804	.22977	−.59106
.900	−3.04712	5.26492	−14.10668	9.000	.44060	.20970	−.54890
.920	−2.93350	5.07487	−13.51289	9.500	.45145	.19185	−.51146
.940	−2.82629	4.89727	−12.96260	10.000	.46088	.17587	−.47798
.960	−2.72495	4.73095	−12.45146	10.500	.46910	.16148	−.44786
.980	−2.62902	4.57491	−11.97566	11.000	.47631	.14845	−.42063
1.000	−2.53808	4.42826	−11.53185	11.500	.48264	.13661	−.39588
1.025	−2.43087	4.25694	−11.01760	12.000	.48822	.12580	−.37330
1.050	−2.33022	4.09767	−10.54370	12.500	.49316	.11589	−.35260
1.075	−2.23556	3.94925	−10.10581	13.000	.49752	.10678	−.33358
1.100	−2.14638	3.81064	−9.70016	13.500	.50139	.09837	−.31601
1.150	−1.98265	3.55930	−8.97290	14.000	.50483	.09059	−.29976
1.200	−1.83595	3.33749	−8.34033	15.000	.51059	.07665	−.27063
1.250	−1.70378	3.14041	−7.78576	16.000	.51514	.06453	−.24528
1.300	−1.58411	2.96421	−7.29612	17.000	.51873	.05390	−.22301
1.350	−1.47526	2.80578	−6.86099	18.000	.52154	.04450	−.20331
1.400	−1.37585	2.66262	−6.47205	19.000	.52371	.03614	−.18575
1.450	−1.28472	2.53265	−6.12254	20.000	.52537	.02866	−.17000

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=12$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
.300	3.65148	38.68728	−183.7527	1185.505	2.320998+01	−1.592469+02	1.328510+03
.305	3.62143	35.78234	−168.0008	1073.954	2.073082+01	−1.411148+02	1.169009+03
.310	3.59211	33.16651	−153.9687	975.4404	1.856657+01	−1.254104+02	1.031822+03
.315	3.56348	30.80484	−141.4332	888.1764	1.667137+01	−1.117638+02	9.134210+02
.320	3.53553	28.66728	−130.2041	810.6532	1.500682+01	−9.986779+01	8.108927+02
.325	3.50823	26.72794	−120.1191	741.5921	1.354066+01	−8.946640+01	7.218267+02
.330	3.48155	24.96436	−111.0389	679.9048	1.224569+01	−8.034528+01	6.442180+02
.335	3.45547	23.35707	−102.8438	624.6628	1.109891+01	−7.232441+01	5.763935+02
.340	3.42997	21.88912	−95.43027	575.0705	1.008076+01	−6.525204+01	5.169516+02
.345	3.40503	20.54569	−88.70898	530.4446	9.174612+00	−5.899982+01	4.647142+02
.350	3.38062	19.31380	−82.60223	490.1960	8.366242+00	−5.345879+01	4.186873+02
.360	3.33333	17.14046	−71.97054	420.8617	6.995789+00	−4.415291+01	3.420272+02
.370	3.28798	15.29321	−63.09020	363.7485	5.890877+00	−3.674230+01	2.816437+02
.380	3.24443	13.71270	−55.61877	316.3363	4.992877+00	−3.079045+01	2.336525+02
.390	3.20256	12.35204	−49.29015	276.6918	4.257551+00	−2.597199+01	1.951898+02
.400	3.16228	11.17390	−43.89564	243.3179	3.651197+00	−2.204193+01	1.641214+02
.410	3.12348	10.14831	−39.27017	215.0448	3.147896+00	−1.881402+01	1.388405+02
.420	3.08607	9.251022	−35.28215	190.9506	2.727551+00	−1.614536+01	1.181268+02
.430	3.04997	8.462273	−31.82584	170.3031	2.374446+00	−1.392542+01	1.010446+02
.440	3.01511	7.765863	−28.81573	152.5163	2.076201+00	−1.206798+01	8.687082+01
.450	2.98142	7.148420	−26.18215	137.1184	1.822989+00	−1.050531+01	7.504226+01
.460	2.94884	6.598842	−23.86802	123.7262	1.606963+00	−9.183809+00	6.511692+01
.470	2.91730	6.107858	−21.82626	112.0273	1.421809+00	−8.060755+00	5.674547+01
.480	2.88675	5.667690	−20.01784	101.7650	1.262423+00	−7.101914+00	4.965006+01
.490	2.85714	5.271774	−18.41024	92.72740	1.124649+00	−6.279659+00	4.360824+01
.500	2.82843	4.914546	−16.97618	84.73860	1.005087+00	−5.571579+00	3.844086+01
.510	2.80056	4.591271	−15.69273	77.65182	9.009415−01	−4.959391+00	3.400282+01
.520	2.77350	4.297897	−14.54047	71.34402	8.099015−01	−4.428101+00	3.017596+01
.530	2.74721	4.030948	−13.50291	65.71155	7.300475−01	−3.965354+00	2.686356+01
.540	2.72166	3.787426	−12.56600	60.66677	6.597785−01	−3.560919+00	2.398606+01
.550	2.69680	3.564737	−11.71769	56.13518	5.977527−01	−3.206283+00	2.147770+01
.560	2.67261	3.360629	−10.94762	52.05327	5.428416−01	−2.894339+00	1.928390+01
.580	2.62613	3.000556	−9.607687	45.02867	4.506947−01	−2.375611+00	1.566528+01
.600	2.58199	2.694265	−8.488049	39.24266	3.773085−01	−1.967361+00	1.284726+01
.620	2.54000	2.431758	−7.544586	34.43328	3.182912−01	−1.642711+00	1.062862+01
.640	2.50000	2.205217	−6.743408	30.40210	2.704012−01	−1.382063+00	8.864209+00
.660	2.46183	2.008468	−6.058196	26.99702	2.312161−01	−1.170942+00	7.447924+00
.680	2.42536	1.836589	−5.468297	24.10023	1.989058−01	−9.985304−01	6.301235+00
.700	2.39046	1.685620	−4.957351	21.61951	1.720728−01	−8.566553−01	5.365353+00
.720	2.35702	1.552348	−4.512280	19.48203	1.496393−01	−7.390774−01	4.595806+00
.740	2.32495	1.434147	−4.122547	17.62974	1.307668−01	−6.409884−01	3.958608+00
.760	2.29416	1.328854	−3.779593	16.01601	1.147972−01	−5.586497−01	3.427550+00
.780	2.26455	1.234677	−3.476416	14.60310	1.012101−01	−4.891299−01	2.982240+00
.800	2.23607	1.150121	−3.207251	13.36024	8.959036−02	−4.301126−01	2.606689+00
.820	2.20863	1.073932	−2.967317	12.26215	7.960512−02	−3.797535−01	2.288256+00
.840	2.18218	1.005050	−2.752632	11.28798	7.098529−02	−3.365743−01	2.016880+00
.860	2.15666	.9425787	−2.559853	10.42040	6.351211−02	−2.993823−01	1.784495+00
.880	2.13201	.8857519	−2.386164	9.644915	5.700666−02	−2.672088−01	1.584598+00
.900	2.10819	.8339146	−2.229178	8.949357	5.132182−02	−2.392630−01	1.411907+00
.920	2.08514	.7865031	−2.086864	8.323455	4.633591−02	−2.148953−01	1.262113+00
.940	2.06284	.7430306	−1.957487	7.758495	4.194785−02	−1.935696−01	1.131679+00
.960	2.04124	.7030748	−1.839553	7.247052	3.807322−02	−1.748409−01	1.017686+00
.980	2.02031	.6662683	−1.731776	6.782769	3.464122−02	−1.583383−01	9.177154−01
1.000	2.00000	.6322901	−1.633045	6.360189	3.159221−02	−1.437512−01	8.297506−01
1.025	1.97546	.5933692	−1.520887	5.883492	2.824339−02	−1.278172−01	7.341346−01
1.050	1.95180	.5579540	−1.419739	5.456804	2.533251−02	−1.140481−01	6.519464−01
1.075	1.92897	.5256370	−1.328225	5.073541	2.279221−02	−1.020995−01	5.809870−01
1.100	1.90693	.4960679	−1.245179	4.728151	2.056690−02	−9.168922−02	5.194655−01
1.150	1.86501	.4440044	−1.100633	4.132834	1.688481−02	−7.459403−02	4.191269−01
1.200	1.82574	.3997919	−.9796721	3.640834	1.400182−02	−6.133860−02	3.420066−01
1.250	1.78885	.3619283	−.8774831	3.229995	1.171721−02	−5.092922−02	2.819392−01
1.300	1.75412	.3292536	−.7904098	2.883713	9.886898−02	−4.266010−02	2.345864−01
1.350	1.72133	.3008603	−.7156370	2.589360	8.405848−03	−3.602178−02	1.968444−01
1.400	1.69031	.2760308	−.6509703	2.337212	7.196417−03	−3.064113−02	1.664585−01
1.450	1.66091	.2541916	−.5946797	2.119686	6.200460−03	−2.624117−02	1.417682−01

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=12$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
1.50	1.63299	.2348799	−.5453879	1.930812	5.373921−03	−2.261372−02	1.215344−01
1.55	1.60644	.2177192	−.5019873	1.765834	4.683049−03	−1.960056−02	1.048220−01
1.60	1.58114	.2024004	−.4635799	1.620935	4.101723−03	−1.708012−02	9.091731−02
1.65	1.55700	.1886680	−.4294314	1.493022	3.609540−03	−1.495810−02	7.927003−02
1.70	1.53393	.1763096	−.3989370	1.379568	3.190421−03	−1.316069−02	6.945203−02
1.75	1.51186	.1651468	−.3715950	1.278495	2.831592−03	−1.162961−02	6.112720−02
1.80	1.49071	.1550296	−.3469866	1.188083	2.522826−03	−1.031848−02	5.402949−02
1.85	1.47043	.1458307	−.3247600	1.106896	2.255877−03	−9.190136−03	4.794674−02
1.90	1.45095	.1374417	−.3046180	1.033732	2.024054−03	−8.214553−03	4.270849−02
2.00	1.41421	.1227345	−.2696149	.9075639	1.644885−03	−6.628573−03	3.423973−02
2.10	1.38013	.1103084	−.2403650	.8031537	1.352152−03	−5.413574−03	2.779743−02
2.20	1.34840	.09971227	−.2156733	.7157970	1.123004−03	−4.469244−03	2.282268−02
2.30	1.31876	.09060140	−.1946388	.6419886	9.413824−04	−3.725694−03	1.892907−02
2.40	1.29099	.08270886	−.1765725	.5790752	7.957999−04	−3.133321−03	1.584435−02
2.50	1.26491	.07582523	−.1609402	.5250199	6.779041−04	−2.656331−03	1.337332−02
2.60	1.24035	.06978434	−.1473224	.4782382	5.815330−04	−2.268496−03	1.137386−02
2.70	1.21716	.06445300	−.1353863	.4374837	5.020790−04	−1.950331−03	9.741019−03
2.80	1.19523	.05972342	−.1248652	.4017650	4.360544−04	−1.687177−03	8.396233−03
2.90	1.17444	.05550756	−.1155430	.3702857	3.807889−04	−1.467873−03	7.280018−03
3.00	1.15470	.05173303	−.1072437	.3424009	3.342171−04	−1.283833−03	6.346822−03
3.10	1.13592	.04833977	−.09982207	.3175830	2.947254−04	−1.128383−03	5.561407−03
3.20	1.11803	.04527763	−.09315812	.2953979	2.610424−04	−9.962881−04	4.896251−03
3.30	1.10096	.04250452	−.08715157	.2754856	2.321575−04	−8.834086−04	4.329672−03
3.40	1.08465	.03998481	−.08171823	.2575454	2.072613−04	−7.864416−04	3.844444−03
3.50	1.06904	.03768826	−.07678701	.2413245	1.857008−04	−7.027338−04	3.426779−03
3.60	1.05409	.03558902	−.07229753	.2266097	1.669458−04	−6.301383−04	3.065558−03
3.70	1.03975	.03366488	−.06819822	.2132197	1.505625−04	−5.669066−04	2.751758−03
3.80	1.02598	.03189670	−.06444212	.2009919	1.361944−04	−5.116055−04	2.478006−03
3.90	1.01274	.03026789	−.06099933	.1898161	1.235464−04	−4.630539−04	2.238244−03
4.00	1.00000	.02876404	−.05782862	.1795553	1.123733−04	−4.202724−04	2.027463−03
4.25	.97014	.02547215	−.05092486	.1573198	8.962729−05	−3.335301−04	1.601664−03
4.50	.94281	.02272808	−.04521082	.1390330	7.248913−05	−2.685330−04	1.284206−03
4.75	.91766	.02041552	−.04042619	.1238086	5.935620−05	−2.189766−04	1.043269−03
5.00	.89443	.01844764	−.03637839	.1109958	4.914026−05	−1.806027−04	8.574756−04
5.25	.87287	.01675848	−.03292237	.1001081	4.108601−05	−1.504760−04	7.121697−04
5.50	.85280	.01529725	−.02994738	.09077701	3.465975−05	−1.265336−04	5.970967−04
5.75	.83406	.01402425	−.02736718	.08271642	2.947558−05	−1.072845−04	5.048849−04
6.00	.81650	.01290813	−.02511435	.07570466	2.525113−05	−9.165314−05	4.302312−04
6.25	.80000	.01192403	−.02313557	.06956694	2.177786−05	−7.884132−05	3.692164−04
6.50	.78446	.01105139	−.02138726	.06416147	1.889841−05	−6.825087−05	3.189140−04
6.75	.76980	.01027390	−.01983480	.05937588	1.649301−05	−5.942804−05	2.771114−04
7.00	.75593	.009578063	−.01844971	.05511815	1.446941−05	−5.202470−05	2.421161−04
7.25	.74278	.008952678	−.01720853	.05131277	1.275590−05	−4.577099−05	2.126200−04
7.50	.73030	.008388432	−.01609178	.04789733	1.129618−05	−4.045566−05	1.876018−04
7.75	.71842	.007877507	−.01508320	.04481986	1.004565−05	−3.591190−05	1.662571−04
8.00	.70711	.007413303	−.01416911	.04203679	8.968693−06	−3.200683−05	1.479468−04
8.25	.69631	.006990218	−.01333792	.03951140	8.036664−06	−2.863384−05	1.321593−04
8.50	.68599	.006603472	−.01257981	.03721253	7.226349−06	−2.570676−05	1.184818−04
9.00	.66667	.005923159	−.01125030	.03319191	5.898492−06	−2.092237−05	9.617731−05
9.50	.64889	.005345823	−.01012633	.02980434	4.870378−06	−1.722990−05	7.901348−05
10.00	.63246	.004851430	−.009167177	.02692238	4.063046−06	−1.433892−05	6.561111−05
10.50	.61721	.004424625	−.008341773	.02444927	3.421028−06	−1.204614−05	5.500809−05
11.00	.60302	.004053471	−.007626090	.02231044	2.904628−06	−1.020659−05	4.652033−05
11.50	.58977	.003728570	−.007001281	.02044763	2.484961−06	−8.715107−06	3.965302−05
12.00	.57735	.003442438	−.006452406	.01881482	2.140692−06	−7.494227−06	3.404267−05
12.50	.56569	.003189068	−.005967503	.01737527	1.855841−06	−6.486102−06	2.941847−05
13.00	.55470	.002963571	−.005536880	.01609930	1.618292−06	−5.646973−06	2.557602−05
13.50	.54433	.002761948	−.005152628	.01496276	1.418749−06	−4.943349−06	2.235923−05
14.00	.53452	.002580896	−.004808236	.01394582	1.250006−06	−4.349325−06	1.964759−05
15.00	.51640	.002269967	−.004218326	.01220786	9.835387−07	−3.413401−06	1.538397−05
16.00	.50000	.002013688	−.003733654	.01078394	7.863749−07	−2.722856−06	1.224621−05
17.00	.48507	.001799801	−.003330311	.009601930	6.376173−07	−2.203178−06	9.890298−06
18.00	.47140	.001619325	−.002990852	.008609380	5.234416−07	−1.805234−06	8.090018−06
19.00	.45883	.001465554	−.002702300	.007767409	4.344680−07	−1.495783−06	6.692747−06
20.00	.44721	.001333394	−.002454836	.007046677	3.641886−07	−1.251825−06	5.593116−06

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m=18$

T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$	T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$
.300	−21.20540	58.61918	−272.49826	1.500	−.71082	1.87235	−4.49981
.305	−20.26497	55.21349	−253.64084	1.550	−.65081	1.78846	−4.27890
.310	−19.39277	52.10189	−236.59096	1.600	−.59526	1.71139	−4.07764
.315	−18.58219	49.25225	−221.13542	1.650	−.54370	1.64033	−3.89357
.320	−17.82738	46.63658	−207.09039	1.700	−.49572	1.57462	−3.72464
.325	−17.12318	44.23046	−194.29682	1.750	−.45097	1.51368	−3.56910
.330	−16.46500	42.01248	−182.61664	1.800	−.40913	1.45702	−3.42545
.335	−15.84879	39.96386	−171.92964	1.850	−.36994	1.40419	−3.29240
.340	−15.27091	38.06803	−162.13085	1.900	−.33315	1.35483	−3.16885
.345	−14.72812	36.31037	−153.12833	2.000	−.26598	1.26524	−2.94650
.350	−14.21752	34.67794	−144.84136	2.100	−.20621	1.18607	−2.75209
.360	−13.22272	31.74403	−130.13795	2.200	−.15269	1.11560	−2.58072
.370	−12.44860	29.18859	−117.54536	2.300	−.10452	1.05247	−2.42858
.380	−11.70056	26.94951	−106.68972	2.400	−.06095	.99561	−2.29266
.390	−11.02657	24.97678	−97.27429	2.500	−.02136	.94412	−2.17051
.400	−10.41668	23.22975	−89.06153	2.600	.01474	.89728	−2.06016
.410	−9.86255	21.67517	−81.85975	2.700	.04779	.85448	−1.96000
.420	−9.35722	20.28563	−75.51307	2.800	.07814	.81524	−1.86868
.430	−8.89476	19.03839	−69.89392	2.900	.10611	.77911	−1.78511
.440	−8.47017	17.91447	−64.89715	3.000	.13196	.74575	−1.70833
.450	−8.07915	16.89795	−60.43556	3.100	.15590	.71484	−1.63756
.460	−7.71801	15.97535	−56.43640	3.200	.17814	.68614	−1.57212
.470	−7.38358	15.13527	−52.83866	3.300	.19884	.65940	−1.51144
.480	−7.07310	14.36795	−49.59091	3.400	.21815	.63444	−1.45502
.490	−6.78417	13.66507	−46.64955	3.500	.23620	.61108	−1.40242
.500	−6.51469	13.01943	−43.97747	3.600	.25310	.58917	−1.35327
.510	−6.26282	12.42482	−41.54292	3.700	.26896	.56858	−1.30724
.520	−6.02693	11.87587	−39.31864	3.800	.28386	.54921	−1.26405
.530	−5.80561	11.36787	−37.28114	3.900	.29789	.53093	−1.22345
.540	−5.59756	10.89673	−35.41004	4.000	.31111	.51366	−1.18520
.550	−5.40167	10.45885	−33.68768	4.250	.34105	.47440	−1.09863
.560	−5.21692	10.05106	−32.09684	4.500	.36717	.43991	−1.02304
.580	−4.87735	9.31488	−29.26819	4.750	.39012	.40937	−.95647
.600	−4.57267	8.66943	−26.82924	5.000	.41041	.38213	−.89740
.620	−4.29788	8.09881	−24.71207	5.250	.42846	.35769	−.84461
.640	−4.04886	7.59412	−22.86174	5.500	.44458	.33564	−.79716
.660	−3.82222	7.14270	−21.23456	5.750	.45904	.31564	−.75428
.680	−3.61511	6.73770	−19.79538	6.000	.47209	.29741	−.71533
.700	−3.42515	6.37264	−18.51574	6.250	.48389	.28074	−.67981
.720	−3.25034	6.04218	−17.37234	6.500	.49459	.26543	−.64726
.740	−3.08895	5.74183	−16.34601	6.750	.50434	.25132	−.61735
.760	−2.93952	5.46783	−15.42086	7.000	.51325	.23828	−.58975
.780	−2.80078	5.21701	−14.58362	7.250	.52140	.22618	−.56420
.800	−2.67164	4.98666	−13.82311	7.500	.52887	.21493	−.54050
.820	−2.55115	4.77448	−13.12993	7.750	.53575	.20444	−.51843
.840	−2.43848	4.57847	−12.49605	8.000	.54208	.19465	−.49786
.860	−2.33290	4.39692	−11.91464	8.250	.54793	.18547	−.47861
.880	−2.23377	4.22834	−11.37982	8.500	.55333	.17687	−.46057
.900	−2.14053	4.07144	−10.88652	9.000	.56299	.16115	−.42769
.920	−2.05266	3.92510	−10.43041	9.500	.57132	.14715	−.39847
.940	−1.96973	3.78830	−10.00761	10.000	.57854	.13461	−.37234
.960	−1.89133	3.66017	−9.61481	10.500	.58483	.12331	−.34882
.980	−1.81711	3.53994	−9.24911	11.000	.59033	.11308	−.32755
1.000	−1.74674	3.42693	−8.90793	11.500	.59515	.10377	−.30821
1.025	−1.66376	3.29487	−8.51253	12.000	.59938	.09527	−.29056
1.050	−1.58585	3.17208	−8.14806	12.500	.60311	.08747	−.27438
1.075	−1.51258	3.05764	−7.81123	13.000	.60640	.08029	−.25949
1.100	−1.44352	2.95073	−7.49913	13.500	.60930	.07366	−.24575
1.150	−1.31672	2.75682	−6.93941	14.000	.61187	.06753	−.23303
1.200	−1.20308	2.58565	−6.45240	15.000	.61615	.05652	−.21021
1.250	−1.10068	2.43350	−6.02529	16.000	.61948	.04694	−.19035
1.300	−1.00793	2.29743	−5.64804	17.000	.62207	.03852	−.17289
1.350	−.92356	2.17505	−5.31268	18.000	.62405	.03107	−.15743
1.400	−.84649	2.06443	−5.01283	19.000	.62555	.02443	−.14364
1.450	−.77583	1.96397	−4.74328	20.000	.62665	.01848	−.13127

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TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=18$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
.300	2.94283	35.33701	−166.2731	1067.080	2.343779+01	−1.610717+02	1.344799+03
.305	2.91861	32.70767	−152.1056	967.1021	2.093035+01	−1.427159+02	1.183257+03
.310	2.89498	30.33868	−139.4799	878.7802	1.874167+01	−1.268188+02	1.044322+03
.315	2.87191	28.19866	−128.1960	800.5186	1.682529+01	−1.130056+02	9.244155+02
.320	2.84938	26.26062	−118.0840	730.9708	1.514235+01	−1.009653+02	8.205895+02
.325	2.82738	24.50133	−108.9985	668.9944	1.366016+01	−9.043855+01	7.303999+02
.330	2.80588	22.90058	−100.8149	613.6173	1.235120+01	−8.120811+01	6.518163+02
.335	2.78486	21.44089	−93.42592	564.0102	1.119218+01	−7.309174+01	5.831428+02
.340	2.76431	20.10700	−86.73896	519.4624	1.016329+01	−6.593571+01	5.229603+02
.345	2.74420	18.88559	−80.67392	479.3626	9.247712+00	−5.961000+01	4.700745+02
.350	2.72453	17.76499	−75.16117	443.1846	8.431034+00	−5.400435+01	4.234787+02
.360	2.68642	15.78639	−65.55785	380.8329	7.046783+00	−4.459105+01	3.458775+02
.370	2.64987	14.10286	−57.53000	329.4386	5.931058+00	−3.709618+01	2.847595+02
.380	2.61477	12.66089	−50.77037	286.7465	5.024541+00	−3.107773+01	2.361903+02
.390	2.58103	11.41822	−45.04009	251.0262	4.282464+00	−2.620625+01	1.972691+02
.400	2.54857	10.34113	−40.15173	220.9366	3.670733+00	−2.223372+01	1.658343+02
.410	2.51729	9.402550	−35.95693	195.4297	3.163133+00	−1.897156+01	1.402587+02
.420	2.48715	8.580565	−32.33737	173.6791	2.739337+00	−1.627514+01	1.193064+02
.430	2.45806	7.857301	−29.19799	155.0281	2.383452+00	−1.403258+01	1.020298+02
.440	2.42996	7.218093	−26.46175	138.9513	2.082962+00	−1.215662+01	8.769682+01
.450	2.40281	6.650828	−24.06597	125.0249	1.827935+00	−1.057872+01	7.573723+01
.460	2.37655	6.145439	−21.95918	112.9051	1.610437+00	−9.244632+00	6.570343+01
.470	2.35113	5.693521	−20.09896	102.3112	1.424091+00	−8.111153+00	5.724191+01
.480	2.32651	5.288007	−18.45011	93.01248	1.263737+00	−7.143643+00	5.007127+01
.490	2.30265	4.922942	−16.98326	84.81846	1.125179+00	−6.314150+00	4.396642+01
.500	2.27951	4.593261	−15.67382	77.57096	1.004983+00	−5.600017+00	3.874603+01
.510	2.25705	4.294663	−14.50104	71.13790	9.003261−01	−4.982751+00	3.426324+01
.520	2.23524	4.023457	−13.44739	65.40854	8.088746−01	−4.447193+00	3.039848+01
.530	2.21405	3.776476	−12.49796	60.28954	7.286924−01	−3.980850+00	2.705388+01
.540	2.19346	3.550990	−11.64002	55.70193	6.581626−01	−3.573379+00	2.414895+01
.550	2.17342	3.344633	−10.86267	51.57860	5.959326−01	−3.216180+00	2.161716+01
.560	2.15393	3.155347	−10.15654	47.86226	5.408630−01	−2.902067+00	1.940329+01
.580	2.11647	2.821049	−8.926637	41.46131	4.485073−01	−2.379945+00	1.575261+01
.600	2.08090	2.536273	−7.897581	36.18302	3.750177−01	−1.969258+00	1.291078+01
.620	2.04706	2.291863	−7.029326	31.79070	3.159682−01	−1.642862+00	1.067433+01
.640	2.01482	2.080657	−6.291086	28.10503	2.680942−01	−1.380968+00	8.896512+00
.660	1.98406	1.896992	−5.658930	24.98844	2.289571−01	−1.168967+00	7.470087+00
.680	1.95466	1.736346	−5.114055	22.33423	1.967154−01	−9.959455−01	6.315712+00
.700	1.92654	1.595077	−4.641557	20.05887	1.699636−01	−8.536575−01	5.373988+00
.720	1.89959	1.470226	−4.229513	18.09632	1.476186−01	−7.358130−01	4.599999+00
.740	1.87374	1.359374	−3.868302	16.39390	1.288380−01	−6.375651−01	3.959428+00
.760	1.84892	1.260526	−3.550106	14.90927	1.129609−01	−5.551477−01	3.425818+00
.780	1.82507	1.172024	−3.268523	13.60813	9.946504−02	−4.856076−01	2.978590+00
.800	1.80211	1.092489	−3.018278	12.46251	8.793432−02	−4.266127−01	2.601608+00
.820	1.78000	1.020756	−2.794982	11.44937	7.803492−02	−3.763068−01	2.282125+00
.840	1.75868	.9558473	−2.594996	10.54975	6.949726−02	−3.332027−01	2.009993+00
.860	1.73811	.8969294	−2.415249	9.747838	6.210238−02	−2.961010−01	1.777082+00
.880	1.71824	.8432917	−2.253154	9.030424	5.567124−02	−2.640279−01	1.576837+00
.900	1.69904	.7943253	−2.106518	8.386396	5.005669−02	−2.361888−01	1.403938+00
.920	1.68047	.7495066	−1.973474	7.806376	4.513715−02	−2.119311−01	1.254043+00
.940	1.66250	.7083819	−1.852421	7.282399	4.081165−02	−1.907167−01	1.123592+00
.960	1.64509	.6705579	−1.741987	6.807670	3.699591−02	−1.720989−01	1.009647+00
.980	1.62822	.6356923	−1.640984	6.376377	3.361932−02	−1.557058−01	9.097716−01
1.000	1.61185	.6034856	−1.548387	5.983519	3.062240−02	−1.412259−01	8.219396−01
1.025	1.59208	.5665690	−1.443110	5.539973	2.733434−02	−1.254215−01	7.265276−01
1.050	1.57301	.5329531	−1.348081	5.142590	2.447970−02	−1.117767−01	6.445716−01
1.075	1.55461	.5022571	−1.262030	4.785327	2.199143−02	−9.994667−02	5.738631−01
1.100	1.53684	.4741528	−1.183874	4.463085	1.981432−02	−8.964902−02	5.126019−01
1.150	1.50306	.4246236	−1.047680	3.906975	1.621825−02	−7.276125−02	4.127924−01
1.200	1.47142	.3825159	−.9335348	3.446628	1.340929−02	−5.969041−02	3.361887−01
1.250	1.44169	.3464183	−.8369666	3.061627	1.118858−02	−4.944459−02	2.766098−01
1.300	1.41369	.3152386	−.7545735	2.736649	9.413619−03	−4.132019−02	2.297102−01
1.350	1.38726	.2881221	−.6837319	2.460022	7.980688−03	−3.480987−02	1.923839−01
1.400	1.36227	.2643911	−.6223938	2.222745	6.813238−03	−2.954250−02	1.623766−01
1.450	1.33857	.2435039	−.5689427	2.017793	5.854049−03	−2.524293−02	1.380294−01

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m = 18$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
1.50	1.31607	.2250225	−.5220897	1.839624	5.059820−03	−2.170460−02	1.181061−01
1.55	1.29467	.2085906	−.4807969	1.683821	4.397440−03	−1.877070−02	1.016741−01
1.60	1.27428	.1939149	−.4442223	1.546834	3.841324−03	−1.632093−02	8.802259−02
1.65	1.25483	.1807532	−.4116760	1.425781	3.371517−03	−1.426205−02	7.660408−02
1.70	1.23624	.1689034	−.3825894	1.318307	2.972323−03	−1.252117−02	6.699292−02
1.75	1.21845	.1581963	−.3564904	1.222473	2.631286−03	−1.104084−02	5.885525−02
1.80	1.20141	.1484888	−.3329844	1.136672	2.338455−03	−9.775371−03	5.192714−02
1.85	1.18506	.1396599	−.3117395	1.059561	2.085816−03	−8.688183−03	4.599826−02
1.90	1.16936	.1316062	−.2924755	.9900146	1.866877−03	−7.749795−03	4.089983−02
2.00	1.13975	.1174825	−.2589703	.8699520	1.509860−03	−6.228055−03	3.267428−02
2.10	1.11229	.1055451	−.2309437	.7704562	1.235343−03	−5.066165−03	2.643467−02
2.20	1.08671	.09536320	−.2072633	.6871061	1.021305−03	−4.166085−03	2.162989−02
2.30	1.06283	.08660698	−.1870743	.6166021	8.523163−04	−3.459671−03	1.787970−02
2.40	1.04045	.07902087	−.1697222	.5564421	7.173742−04	−2.898677−03	1.491671−02
2.50	1.01943	.07240422	−.1546985	.5047028	6.085021−04	−2.448370−03	1.254959−02
2.60	.99963	.06659769	−.1416039	.4598867	5.198311−04	−2.083360−03	1.063932−02
2.70	.98094	.06147347	−.1301210	.4208133	4.469868−04	−1.784830−03	9.083411−03
2.80	.96327	.05692807	−.1199951	.3865429	3.866669−04	−1.538654−03	7.805313−03
2.90	.94651	.05287694	−.1110199	.3563202	3.363500−04	−1.334101−03	6.747168−03
3.00	.93060	.04925046	−.1030271	.3295322	2.940914−04	−1.162937−03	5.864758−03
3.10	.91547	.04599094	−.09587766	.3056773	2.583759−04	−1.018775−03	5.123939−03
3.20	.90105	.04305014	−.08945669	.2843420	2.280126−04	−8.966161−04	4.498097−03
3.30	.88730	.04038753	−.08366808	.2651838	2.020576−04	−7.925153−04	3.966302−03
3.40	.87415	.03796885	−.07843107	.2479158	1.797570−04	−7.033332−04	3.511958−03
3.50	.86157	.03576498	−.07367749	.2322967	1.605039−04	−6.265520−04	3.121802−03
3.60	.84952	.03375104	−.06934931	.2181230	1.438067−04	−5.601394−04	2.785163−03
3.70	.83796	.03190564	−.06539702	.2052212	1.292645−04	−5.024436−04	2.493394−03
3.80	.82686	.03021035	−.06177813	.1934432	1.165483−04	−4.521137−04	2.239441−03
3.90	.81619	.02864920	−.05845594	.1826619	1.053869−04	−4.080381−04	2.017520−03
4.00	.80593	.02720830	−.05539873	.1727676	9.555501−05	−3.692977−04	1.822859−03
4.25	.78186	.02405606	−.04874240	.1513193	7.563357−05	−2.910743−04	1.431079−03
4.50	.75984	.02143076	−.04323390	.1336732	6.072458−05	−2.328092−04	1.140543−03
4.75	.73957	.01922034	−.03862239	.1189782	4.937391−05	−1.886398−04	9.211718−04
5.00	.72084	.01734116	−.03472213	.1066087	4.059965−05	−1.546287−04	7.528650−04
5.25	.70347	.01572969	−.03139326	.09609697	3.372387−05	−1.280713−04	6.218790−04
5.50	.68730	.01433701	−.02852869	.08708710	2.826926−05	−1.070719−04	5.186213−04
5.75	.67219	.01312493	−.02604542	.07930482	2.389378−05	−9.027775−05	4.362734−04
6.00	.65804	.01206326	−.02387819	.07253570	2.034833−05	−7.670740−05	3.699060−04
6.25	.64474	.01112790	−.02197523	.06661037	1.744887−05	−6.563831−05	3.159022−04
6.50	.63222	.01029942	−.02029497	.06139345	1.505759−05	−5.653132−05	2.715709−04
6.75	.62040	.009561993	−.01880371	.05677570	1.307005−05	−4.897901−05	2.348847−04
7.00	.60922	.008902635	−.01747393	.05266825	1.140620−05	−4.266998−05	2.042983−04
7.25	.59863	.008310601	−.01628297	.04899814	1.000404−05	−3.736381−05	1.786213−04
7.50	.58857	.007776950	−.01521201	.04570503	8.815120−06	−3.287297−05	1.569276−04
7.75	.57900	.007294179	−.01424532	.04273865	7.801211−06	−2.904993−05	1.384901−04
8.00	.56988	.006855960	−.01336969	.04005689	6.931910−06	−2.577759−05	1.227331−04
8.25	.56118	.006456924	−.01257394	.03762422	6.182847−06	−2.296234−05	1.091968−04
8.50	.55286	.006092494	−.01184856	.03541054	5.534367−06	−2.052872−05	9.751177−05
9.00	.53728	.005452278	−.01057757	.03154093	4.478113−06	−1.657294−05	7.855426−05
9.50	.52295	.004909926	−.009504322	.02828302	3.666780−06	−1.354224−05	6.406504−05
10.00	.50971	.004446286	−.008589520	.02551353	3.034529−06	−1.118604−05	5.282504−05
10.50	.49743	.004046699	−.007803205	.02313880	2.535422−06	−9.330019−06	4.398901−05
11.00	.48599	.003699781	−.007122197	.02108677	2.136801−06	−7.850605−06	3.695879−05
11.50	.47531	.003396582	−.006528351	.01930100	1.815054−06	−6.658674−06	3.130433−05
12.00	.46530	.003129984	−.006007272	.01773704	1.552846−06	−5.688951−06	2.671121−05
12.50	.45590	.002894267	−.005547444	.01635933	1.337271−06	−4.892945−06	2.294648−05
13.00	.44705	.002684795	−.005139541	.01513918	1.158599−06	−4.234120−06	1.983453−05
13.50	.43869	.002497775	−.004775967	.01405329	1.009408−06	−3.684787−06	1.724326−05
14.00	.43079	.002330074	−.004450460	.01308249	8.839752−07	−3.223524−06	1.507002−05
15.00	.41618	.002042664	−.003893732	.01142514	6.875071−07	−2.502287−06	1.167737−05
16.00	.40296	.001806405	−.003437298	.01006965	5.436819−07	−1.975445−06	9.204144−06
17.00	.39093	.001609733	−.003058221	.008946254	4.362610−07	−1.582707−06	7.363731−06
18.00	.37992	.001444194	−.002739812	.008004423	3.546099−07	−1.284676−06	5.969383−06
19.00	.36978	.001303483	−.002469679	.007206784	2.915777−07	−1.055022−06	4.896548−06
20.00	.36042	.001182827	−.002238432	.006525001	2.422132−07	−8.753972−07	4.058518−06

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=18$

T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$	T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$
.300	1.000280+01	−8.846354+01	9.041886+02	1.500	1.011229−04	−6.183600−04	4.474453−03
.305	8.646330+00	−7.599426+01	7.722942+02	1.550	8.278298−05	−5.042316−04	3.635082−03
.310	7.498101+00	−6.550538+01	6.619889+02	1.600	6.825157−05	−4.141823−04	2.975428−03
.315	6.522629+00	−5.664906+01	5.693772+02	1.650	5.664435−05	−3.425397−04	2.452580−03
.320	5.691052+00	−4.914416+01	4.913292+02	1.700	4.730268−05	−2.850978−04	2.034861−03
.325	4.979778+00	−4.276231+01	4.253165+02	1.750	3.973106−05	−2.387065−04	1.698642−03
.330	4.369455+00	−3.731732+01	3.692894+02	1.800	3.355334−05	−2.009845−04	1.426134−03
.335	3.844135+00	−3.265664+01	3.215781+02	1.850	2.848143−05	−1.701152−04	1.203813−03
.340	3.390639+00	−2.865496+01	2.808176+02	1.900	2.429293−05	−1.447015−04	1.021320−03
.345	2.998025+00	−2.520881+01	2.458870+02	2.000	1.791144−05	−1.061460−04	7.455637−04
.350	2.657181+00	−2.223254+01	2.158631+02	2.100	1.342318−05	−7.917584−05	5.536588−04
.360	2.101576+00	−1.741655+01	1.676095+02	2.200	1.020810−05	−5.995272−05	4.175227−04
.370	1.676416+00	−1.376681+01	1.313676+02	2.300	7.866680−06	−4.601766−05	3.192658−04
.380	1.347989+00	−1.097351+01	1.038669+02	2.400	6.135780−06	−3.576003−05	2.472303−04
.390	1.092031+00	−8.815848+00	8.279819+01	2.500	4.838632−06	−2.810335−05	1.936620−04
.400	8.908944−01	−7.134704+00	6.651154+01	2.600	3.854342−06	−2.231480−05	1.533052−04
.410	7.316014−01	−5.814156+00	5.381487+01	2.700	3.098849−06	−1.788712−05	1.225369−04
.420	6.045202−01	−4.768903+00	4.383803+01	2.800	2.512821−06	−1.446372−05	9.882032−05
.430	5.024356−01	−3.935579+00	3.593958+01	2.900	2.053796−06	−1.179037−05	8.035315−05
.440	4.198951−01	−3.266683+00	2.964228+01	3.000	1.690985−06	−9.683416−06	6.583800−05
.450	3.527450−01	−2.726315+00	2.458798+01	3.100	1.401808−06	−8.008590−06	5.432933−05
.460	2.977967−01	−2.287117+00	2.050566+01	3.200	1.169508−06	−6.666615−06	4.513012−05
.470	2.525841−01	−1.928087+00	1.718864+01	3.300	9.815310−07	−5.583311−06	3.772107−05
.480	2.151869−01	−1.632984+00	1.447812+01	3.400	8.283777−07	−4.702711−06	3.171145−05
.490	1.840999−01	−1.389163+00	1.225126+01	3.500	7.027936−07	−3.982198−06	2.680447−05
.500	1.581357−01	−1.186716+00	1.041235+01	3.600	5.991937−07	−3.389044−06	2.277275−05
.510	1.363520−01	−1.017830+00	8.886378+00	3.700	5.132433−07	−2.897910−06	1.944073−05
.520	1.179973−01	−8.763100−01	7.614202+00	3.800	4.415530−07	−2.489032−06	1.667168−05
.530	1.024681−01	−7.572126−01	6.548892+00	3.900	3.814538−07	−2.146877−06	1.435845−05
.540	8.927786−02	−6.565754−01	5.653026+00	4.000	3.308300−07	−1.859162−06	1.241646−05
.550	7.803233−02	−5.712049−01	4.896599+00	4.250	2.354529−07	−1.318563−06	8.776909−06
.560	6.841034−02	−4.985139−01	4.255428+00	4.500	1.710447−07	−9.548546−07	6.336905−06
.580	5.303302−02	−3.831351−01	3.244187+00	4.750	1.265365−07	−7.043670−07	4.661836−06
.600	4.155396−02	−2.977712−01	2.502209+00	5.000	9.514299−08	−5.282309−07	3.487403−06
.620	3.288211−02	−2.338249−01	1.950745+00	5.250	7.258995−08	−4.020507−07	2.648310−06
.640	2.625839−02	−1.853702−01	1.535979+00	5.500	5.611789−08	−3.101307−07	2.038545−06
.660	2.114713−02	−1.482617−01	1.220572+00	5.750	4.390588−08	−2.421463−07	1.588581−06
.680	1.716534−02	−1.195604−01	9.782559−01	6.000	3.472815−08	−1.911667−07	1.251873−06
.700	1.403587−02	−9.715668−02	7.903123−01	6.250	2.774452−08	−1.524545−07	9.966882−07
.720	1.155589−02	−7.951782−02	6.432393−01	6.500	2.236957−08	−1.227167−07	8.010178−07
.740	9.575345−03	−6.551848−02	5.271887−01	6.750	1.818911−08	−9.962919−08	6.493633−07
.760	7.982156−03	−5.432375−02	4.349010−01	7.000	1.490606−08	−8.152826−08	5.306537−07
.780	6.691809−03	−4.530824−02	3.609719−01	7.250	1.230454−08	−6.720758−08	4.368764−07
.800	5.640021−03	−3.799929−02	3.013407−01	7.500	1.022584−08	−5.578187−08	3.621621−07
.820	4.777492−03	−3.203661−02	2.529098−01	7.750	8.551941−09	−4.659415−08	3.021624−07
.840	4.066121−03	−2.714335−02	2.133862−01	8.000	7.194230−09	−3.915180−08	2.536220−07
.860	3.476247−03	−2.310519−02	1.808992−01	8.250	6.085494−09	−3.308187−08	2.140799−07
.880	2.984613−03	−1.975501−02	1.540630−01	8.500	5.174309−09	−2.809942−08	1.816587−07
.900	2.572868−03	−1.696162−02	1.317794−01	9.000	3.794692−09	−2.056778−08	1.327254−07
.920	2.226443−03	−1.462136−02	1.131850−01	9.500	2.831507−09	−1.532038−08	9.869983−08
.940	1.933697−03	−1.265181−02	9.759618−02	10.000	2.145774−09	−1.159157−08	7.456436−08
.960	1.685280−03	−1.098710−02	8.446897−02	10.500	1.648931−09	−8.894562−09	5.713598−08
.980	1.473643−03	−9.574260−03	7.336771−02	11.000	1.283207−09	−6.912452−09	4.434660−08
1.000	1.292656−03	−8.370478−03	6.394179−02	11.500	1.010108−09	−5.434517−09	3.482368−08
1.025	1.101998−03	−7.107388−03	5.408823−02	12.000	8.034940−10	−4.317844−09	2.763739−08
1.050	9.436547−04	−6.062845−03	4.597221−02	12.500	6.453000−10	−3.463979−09	2.214924−08
1.075	8.114794−04	−5.194488−03	3.925104−02	13.000	5.228424−10	−2.803785−09	1.791063−08
1.100	7.006143−04	−4.468990−03	3.365636−02	13.500	4.270856−10	−2.288108−09	1.460331−08
1.150	5.281406−04	−3.346459−03	2.504415−02	14.000	3.515048−10	−1.881506−09	1.199812−08
1.200	4.036417−04	−2.541843−03	1.891173−02	15.000	2.430342−10	−1.298779−09	8.269380−09
1.250	3.123739−04	−1.955835−03	1.447283−02	16.000	1.721883−10	−9.188623−10	5.842406−09
1.300	2.445188−04	−1.522799−03	1.121143−02	17.000	1.246249−10	−6.641655−10	4.217733−09
1.350	1.934165−04	−1.198527−03	8.782239−03	18.000	9.191592−11	−4.892701−10	3.103589−09
1.400	1.544732−04	−9.527243−04	6.950123−03	19.000	6.893949−11	−3.665713−10	2.322900−09
1.450	1.244709−04	−7.643018−04	5.552313−03	20.000	5.249002−11	−2.788300−10	1.765249−09

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m=24$

T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$	T*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$
.300	−17.93726	49.47168	−228.79492	1.500	−.48351	1.62450	−3.88762
.305	−17.15247	46.66943	−213.30859	1.550	−.43144	1.55224	−3.69807
.310	−16.41125	44.06421	−199.11621	1.600	−.38322	1.48582	−3.52531
.315	−15.72773	41.68213	−186.26172	1.650	−.33845	1.42456	−3.36726
.320	−15.08829	39.48920	−174.51831	1.700	−.29677	1.36790	−3.22215
.325	−14.49091	37.46426	−163.79614	1.750	−.25789	1.31533	−3.08849
.330	−13.93338	35.59863	−154.00153	1.800	−.22153	1.26644	−2.96501
.335	−13.41112	33.87363	−145.02933	1.850	−.18746	1.22086	−2.85061
.340	−12.92118	32.27675	−136.79972	1.900	−.15547	1.17825	−2.74433
.345	−12.46084	30.79570	−129.23615	2.000	−.09705	1.10089	−2.55301
.350	−12.02771	29.41992	−122.27254	2.100	−.04502	1.03249	−2.38562
.360	−11.23441	26.94653	−109.91423	2.200	.00158	.97159	−2.23801
.370	−10.52616	24.79128	−99.32657	2.300	.04354	.91701	−2.10691
.380	−9.89064	22.90208	−90.19633	2.400	.08151	.86784	−1.98972
.390	−9.31772	21.23692	−82.27485	2.500	.11602	.82329	−1.88437
.400	−8.79901	19.76168	−75.36300	2.600	.14751	.78276	−1.78917
.410	−8.32750	18.44844	−69.30005	2.700	.17635	.74572	−1.70272
.420	−7.89729	17.27415	−63.95534	2.800	.20284	.71174	−1.62389
.430	−7.50340	16.21972	−59.22183	2.900	.22727	.68046	−1.55171
.440	−7.14158	15.26920	−55.01132	3.000	.24984	.65156	−1.48539
.450	−6.80823	14.40917	−51.25063	3.100	.27076	.62479	−1.42425
.460	−6.50021	13.62833	−47.87873	3.200	.29020	.59991	−1.36769
.470	−6.21486	12.91708	−44.84440	3.300	.30830	.57674	−1.31524
.480	−5.94983	12.26720	−42.10444	3.400	.32520	.55510	−1.26645
.490	−5.70509	11.67169	−39.62226	3.500	.34099	.53485	−1.22096
.500	−5.47288	11.12449	−37.36667	3.600	.35579	.51585	−1.17845
.510	−5.25762	10.62038	−35.31102	3.700	.36968	.49800	−1.13863
.520	−5.05596	10.15482	−33.43239	3.800	.38273	.48119	−1.10126
.530	−4.86667	9.72386	−31.71104	3.900	.39503	.46534	−1.06612
.540	−4.68869	9.32404	−30.12985	4.000	.40662	.45036	−1.03302
.550	−4.52104	8.95233	−28.67396	4.250	.43288	.41629	−.95807
.560	−4.36288	8.60606	−27.33041	4.500	.45580	.38635	−.89261
.580	−4.07203	7.98067	−24.93632	4.750	.47597	.35983	−.83494
.600	−3.81092	7.43203	−22.87233	5.000	.49381	.33618	−.78375
.620	−3.57529	6.94759	−21.07975	5.250	.50969	.31495	−.73799
.640	−3.36164	6.51728	−19.51236	5.500	.52390	.29578	−.69686
.660	−3.16708	6.13296	−18.13334	5.750	.53665	.27840	−.65968
.680	−2.98921	5.78798	−16.91309	6.000	.54816	.26256	−.62591
.700	−2.82599	5.47689	−15.82762	6.250	.55858	.24806	−.59509
.720	−2.67572	5.19513	−14.85731	6.500	.56805	.23475	−.56686
.740	−2.53693	4.93895	−13.98598	6.750	.57668	.22247	−.54090
.760	−2.40836	4.70513	−13.20022	7.000	.58456	.21112	−.51695
.780	−2.28895	4.49101	−12.48883	7.250	.59178	.20059	−.49478
.800	−2.17777	4.29429	−11.84240	7.500	.59841	.19080	−.47421
.820	−2.07399	4.11300	−11.25296	7.750	.60452	.18167	−.45505
.840	−1.97691	3.94548	−10.71375	8.000	.61015	.17314	−.43719
.860	−1.88591	3.79025	−10.21900	8.250	.61536	.16515	−.42047
.880	−1.80045	3.64607	−9.76373	8.500	.62017	.15766	−.40481
.900	−1.72003	3.51183	−9.34368	9.000	.62879	.14396	−.37625
.920	−1.64423	3.38658	−8.95514	9.500	.63624	.13176	−.35087
.940	−1.57267	3.26946	−8.59486	10.000	.64271	.12082	−.32816
.960	−1.50500	3.15973	−8.26005	10.500	.64837	.11097	−.30773
.980	−1.44091	3.05674	−7.94824	11.000	.65332	.10204	−.28924
1.000	−1.38015	2.95990	−7.65724	11.500	.65767	.09391	−.27243
1.025	−1.30847	2.84760	−7.31989	12.000	.66151	.08648	−.25708
1.050	−1.24115	2.74141	−7.00882	12.500	.66490	.07967	−.24301
1.075	−1.17780	2.64325	−6.72123	13.000	.66790	.07340	−.23006
1.100	−1.11810	2.55153	−6.45467	13.500	.67056	.06760	−.21811
1.150	−1.00843	2.38503	−5.97640	14.000	.67292	.06223	−.20704
1.200	−.91009	2.23806	−5.55999	15.000	.67688	.05260	−.13719
1.250	−.82143	2.10732	−5.19458	16.000	.68000	.04420	−.16990
1.300	−.74110	1.99033	−4.87166	17.000	.68245	.03682	−.15470
1.350	−.66799	1.88507	−4.58445	18.000	.68437	.03028	−.14123
1.400	−.60119	1.78988	−4.32751	19.000	.68585	.02445	−.12922
1.450	−.53991	1.70340	−4.09644	20.000	.68696	.01922	−.11843

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=24$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
.300	2.65615	33.12951	−154.6953	988.3657	2.332806+01	−1.603109+02	1.338057+03
.305	2.63429	30.68268	−141.5814	896.1057	2.083242+01	−1.420474+02	1.177390+03
.310	2.61295	28.47708	−129.8904	814.5780	1.865396+01	−1.262292+02	1.039198+03
.315	2.59213	26.48373	−119.4383	742.3162	1.674646+01	−1.124840+02	9.199260+02
.320	2.57180	24.67768	−110.0683	678.0817	1.507126+01	−1.005023+02	8.166433+02
.325	2.55194	23.03743	−101.6466	620.8239	1.359585+01	−9.002610+01	7.269208+02
.330	2.53254	21.54432	−94.05819	569.6487	1.229284+01	−8.083974+01	6.487394+02
.335	2.51357	20.18215	−87.20421	523.7926	1.113906+01	−7.276171+01	5.804141+02
.340	2.49502	18.93682	−80.99928	482.6014	1.011481+01	−6.563920+01	5.205333+02
.345	2.47687	17.79598	−75.36946	445.5129	9.203337+00	−5.934287+01	4.679101+02
.350	2.45911	16.74882	−70.25055	412.0422	8.390318+00	−5.376300+01	4.215434+02
.360	2.42472	14.89870	−61.32876	354.3327	7.012238+00	−4.439254+01	3.443183+02
.370	2.39173	13.32310	−53.86554	306.7384	5.901480+00	−3.693129+01	2.834913+02
.380	2.36005	11.97243	−47.57707	267.1810	4.998991+00	−3.093949+01	2.351492+02
.390	2.32959	10.80743	−42.24262	234.0652	4.260218+00	−2.608935+01	1.964071+02
.400	2.30029	9.796834	−37.68891	206.1545	3.651223+00	−2.213404+01	1.651147+02
.410	2.27207	8.915477	−33.77872	182.4817	3.145906+00	−1.888592+01	1.396533+02
.420	2.24485	8.142985	−30.40255	162.2842	2.724030+00	−1.620102+01	1.187932+02
.430	2.21860	7.462736	−27.47235	144.9559	2.369774+00	−1.396799+01	1.015918+02
.440	2.19324	6.861081	−24.91683	130.0112	2.070675+00	−1.209998+01	8.732055+01
.450	2.16873	6.326737	−22.67786	117.0587	1.816844+00	−1.052875+01	7.541187+01
.460	2.14503	5.850328	−20.70774	105.7806	1.600381+00	−9.200308+00	6.542045+01
.470	2.12209	5.424013	−18.96713	95.91727	1.414935+00	−8.071624+00	5.699433+01
.480	2.09987	5.041204	−17.42336	87.25539	1.255370+00	−7.108212+00	4.985353+01
.490	2.07833	4.696337	−16.04917	79.61869	1.117505+00	−6.282253+00	4.377393+01
.500	2.05744	4.384687	−14.82171	72.86070	9.979219−01	−5.571174+00	3.857501+01
.510	2.03717	4.102229	−13.72172	66.85915	8.938093−01	−4.956564+00	3.411061+01
.520	2.01749	3.845517	−12.73290	61.51143	8.028436−01	−4.423327+00	3.026165+01
.530	1.99836	3.611587	−11.84137	56.73108	7.230960−01	−3.959023+00	2.693072+01
.540	1.97977	3.397882	−11.03530	52.44488	6.529573−01	−3.553351+00	2.403765+01
.550	1.96169	3.202185	−10.30455	48.59060	5.910797−01	−3.197744+00	2.151620+01
.560	1.94410	3.022572	−9.640383	45.11510	5.363294−01	−2.885048+00	1.931138+01
.580	1.91029	2.705088	−8.482650	39.12482	4.445277−01	−2.365325+00	1.567571+01
.600	1.87818	2.434330	−7.512964	34.18054	3.714998−01	−1.956578+00	1.284564+01
.620	1.84764	2.201704	−6.693970	30.06246	3.128394−01	−1.631770+00	1.061856+01
.640	1.81854	2.000476	−5.996927	26.60383	2.652961−01	−1.371192+00	8.848311+00
.660	1.79077	1.825317	−5.399472	23.67666	2.264425−01	−1.160293+00	7.428067+00
.680	1.76424	1.671967	−4.884029	21.18165	1.944455−01	−9.882027−01	6.278790+00
.700	1.73886	1.536994	−4.436651	19.04098	1.679065−01	−8.467092−01	5.341321+00
.720	1.71454	1.417606	−4.046169	17.19308	1.457474−01	−7.295474−01	4.570914+00
.740	1.69121	1.311518	−3.703569	15.58885	1.271301−01	−6.318907−01	3.933386+00
.760	1.66881	1.216843	−3.401518	14.18875	1.113974−01	−5.499879−01	3.402379+00
.780	1.64727	1.132015	−3.134008	12.96076	9.802965−02	−4.808988−01	2.957396+00
.800	1.62655	1.055726	−2.896083	11.87872	8.661302−02	−4.223011−01	2.582363+00
.820	1.60659	.9868747	−2.683628	10.92113	7.681566−02	−3.723471−01	2.264581+00
.840	1.58735	.9245321	−2.493208	10.07022	6.836960−02	−3.295559−01	1.993943+00
.860	1.56879	.8679079	−2.321937	9.311205	6.105720−02	−2.927336−01	1.762352+00
.880	1.55086	.8163273	−2.167380	8.631700	5.470055−02	−2.609110−01	1.563276+00
.900	1.53353	.7692121	−2.027470	8.021300	4.915349−02	−2.332972−01	1.391420+00
.920	1.51677	.7260634	−1.900445	7.471207	4.429524−02	−2.092431−01	1.242458+00
.940	1.50054	.6864503	−1.784798	6.973949	4.002554−02	−1.882128−01	1.112844+00
.960	1.48483	.6499983	−1.679229	6.523149	3.626074−02	−1.697623−01	9.996534−01
.980	1.46960	.6163809	−1.582621	6.113347	3.293074−02	−1.535215−01	9.004610−01
1.000	1.45483	.5853125	−1.494001	5.739841	2.997653−02	−1.391806−01	8.132481−01
1.025	1.43698	.5496828	−1.393183	5.317873	2.673699−02	−1.235337−01	7.185320−01
1.050	1.41977	.5172216	−1.302118	4.939556	2.392611−02	−1.100302−01	6.371972−01
1.075	1.40316	.4875648	−1.219603	4.599203	2.147743−02	−9.832751−02	5.670443−01
1.100	1.38713	.4603990	−1.144613	4.292009	1.933620−02	−8.814492−02	5.062831−01
1.150	1.35664	.4124917	−1.013818	3.761364	1.580246−02	−7.145610−02	4.073319−01
1.200	1.32807	.3717291	−.9040757	3.321562	1.304545−02	−5.855029−02	3.314345−01
1.250	1.30124	.3367582	−.8111352	2.953320	1.086840−02	−4.844265−02	2.724429−01
1.300	1.27597	.3065311	−.7317600	2.642147	9.130401−03	−4.043484−02	2.260362−01
1.350	1.25212	.2802266	−.6634510	2.376999	7.728975−03	−3.402364−02	1.891270−01
1.400	1.22956	.2571935	−.6042555	2.149345	6.588550−03	−2.884110−02	1.594753−01
1.450	1.20817	.2369100	−.5526306	1.952523	5.652667−03	−2.461457−02	1.354333−01

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=24$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
1.50	1.18786	.2189547	-.5073447	1.781272	4.878649-03	-2.113949-02	1.157736-01
1.55	1.16855	.2029836	-.4674054	1.631394	4.233881-03	-1.826065-02	9.957054-02
1.60	1.15015	.1887141	-.4320064	1.499513	3.693181-03	-1.585902-02	8.611885-02
1.65	1.13258	.1759122	-.4004871	1.382884	3.236928-03	-1.384242-02	7.487556-02
1.70	1.11580	.1643828	-.3723022	1.279265	2.849694-03	-1.213885-02	6.541871-02
1.75	1.09975	.1539621	-.3469987	1.186807	2.519255-03	-1.069155-02	5.741753-02
1.80	1.08437	.1445120	-.3241977	1.103974	2.235844-03	-9.455423-03	5.061058-02
1.85	1.06961	.1359151	-.3035804	1.029486	1.991609-03	-8.394406-03	4.478965-02
1.90	1.05545	.1280714	-.2848769	.9622649	1.780187-03	-7.479424-03	3.978769-02
2.00	1.02872	.1143123	-.2523270	.8461249	1.435988-03	-5.997588-03	3.172646-02
2.10	1.00393	.1026796	-.2250792	.7497832	1.171903-03	-4.868170-03	2.562043-02
2.20	.98085	.09275520	-.2020417	.6690016	9.664397-04	-3.994778-03	2.092538-02
2.30	.95929	.08421890	-.1823894	.6006132	8.045630-04	-3.310500-03	1.726617-02
2.40	.93909	.07682236	-.1654885	.5422071	6.755565-04	-2.767866-03	1.437852-02
2.50	.92012	.07037047	-.1508513	.4919554	5.717031-04	-2.333308-03	1.207617-02
2.60	.90225	.06470823	-.1380873	.4483938	4.872803-04	-1.981531-03	1.022025-02
2.70	.88538	.05971124	-.1268903	.4103923	4.180618-04	-1.694299-03	8.710741-03
2.80	.86943	.05527872	-.1170134	.3770446	3.608545-04	-1.457824-03	7.472490-03
2.90	.85431	.05132833	-.1082566	.3476214	3.132245-04	-1.261649-03	6.448756-03
3.00	.83995	.04779224	-.1004562	.3215304	2.732966-04	-1.097756-03	5.596214-03
3.10	.82629	.04461417	-.09347757	.2982868	2.396127-04	-9.599334-04	4.881442-03
3.20	.81328	.04174711	-.08720879	.2774909	2.110279-04	-8.433270-04	4.278417-03
3.30	.80086	.03915155	-.08155649	.2588105	1.866365-04	-7.441091-04	3.766690-03
3.40	.78899	.03679405	-.07644213	.2419679	1.657156-04	-6.592374-04	3.330066-03
3.50	.77764	.03464622	-.07179933	.2267295	1.476845-04	-5.862757-04	2.955616-03
3.60	.76676	.03268375	-.06757164	.2128975	1.320734-04	-5.232591-04	2.632944-03
3.70	.75633	.03088579	-.06371081	.2003038	1.184996-04	-4.685925-04	2.353635-03
3.80	.74631	.02923435	-.06017544	.1888047	1.066496-04	-4.209728-04	2.110834-03
3.90	.73668	.02771383	-.05692979	.1782766	9.626501-05	-3.793292-04	1.898922-03
4.00	.72742	.02631066	-.05394292	.1686130	8.713189-05	-3.427771-04	1.713270-03
4.25	.70570	.02324195	-.04743957	.1476592	6.867476-05	-2.691425-04	1.340387-03
4.50	.68581	.02068741	-.04205776	.1304145	5.491341-05	-2.144770-04	1.064685-03
4.75	.66752	.01853766	-.03755264	.1160503	4.447440-05	-1.731695-04	8.571136-04
5.00	.65062	.01671098	-.03374283	.1039574	3.643303-05	-1.414611-04	6.983070-04
5.25	.63494	.01514537	-.03049165	.09367940	3.015283-05	-1.167766-04	5.750523-04
5.50	.62034	.01379304	-.02769446	.08486935	2.518701-05	-9.731549-05	4.781483-04
5.75	.60671	.01261671	-.02527011	.07725943	2.121623-05	-8.179593-05	4.010679-04
6.00	.59393	.01158692	-.02315482	.07064034	1.800861-05	-6.929033-05	3.391032-04
6.25	.58193	.01068014	-.02129793	.06484654	1.539325-05	-5.911731-05	2.888063-04
6.50	.57063	.009877409	-.01965879	.05974576	1.324253-05	-5.076959-05	2.476177-04
6.75	.55996	.009163287	-.01820444	.05523122	1.145998-05	-4.386468-05	2.136125-04
7.00	.54987	.008525109	-.01690796	.05121601	9.971837-06	-3.811093-05	1.853267-04
7.25	.54031	.007952403	-.01574716	.04762876	8.721109-06	-3.328361-05	1.616346-04
7.50	.53123	.007436447	-.01470364	.04441044	7.663353-06	-2.920780-05	1.416620-04
7.75	.52259	.006969930	-.01376202	.04151189	6.763595-06	-2.574616-05	1.247238-04
8.00	.51436	.006546687	-.01290937	.03889190	5.994081-06	-2.278993-05	1.102786-04
8.25	.50651	.006161489	-.01213476	.03651568	5.332618-06	-2.025229-05	9.789506-05
8.50	.49900	.005809875	-.01142888	.03435375	4.761328-06	-1.806347-05	8.722685-05
9.00	.48494	.005192640	-.01019265	.03057570	3.833944-06	-1.451665-05	6.996908-05
9.50	.47201	.004670274	-.009149451	.02739619	3.124767-06	-1.181045-05	5.682949-05
10.00	.46006	.004224155	-.008260852	.02469450	2.574481-06	-9.714851-06	4.667419-05
10.50	.44897	.003840035	-.007497566	.02237896	2.141860-06	-8.070401-06	3.871917-05
11.00	.43865	.003506856	-.006836942	.02037893	1.797703-06	-6.764443-06	3.241180-05
11.50	.42901	.003215929	-.006261246	.01863925	1.520973-06	-5.715995-06	2.735563-05
12.00	.41997	.002960349	-.005756426	.01711637	1.296281-06	-4.865934-06	2.326181-05
12.50	.41149	.002734571	-.005311229	.01577548	1.112207-06	-4.170473-06	1.991678-05
13.00	.40350	.002534102	-.004916561	.01458852	9.601685-07	-3.596764-06	1.716062-05
13.50	.39595	.002355267	-.004565000	.01353265	8.336395-07	-3.119870-06	1.487209-05
14.00	.38882	.002195038	-.004250446	.01258914	7.276034-07	-2.720649-06	1.295828-05
15.00	.37564	.001920753	-.003712981	.01097976	5.622721-07	-2.099093-06	9.982731-06
16.00	.36371	.001695629	-.003272847	.009664615	4.419605-07	-1.647607-06	7.825060-06
17.00	.35285	.001508503	-.002907739	.008575688	3.526088-07	-1.312843-06	6.227662-06
18.00	.34291	.001351221	-.002601413	.007663608	2.850508-07	-1.060099-06	5.023292-06
19.00	.33376	.001217712	-.002341811	.006891816	2.331535-07	-8.661977-07	4.100465-06
20.00	.32531	.001103382	-.002119828	.006232762	1.927176-07	-7.152984-07	3.383105-06

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=24$

T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$	T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$
.300	1.045960+01	−9.284472+01	9.515266+02	1.500	9.540094−05	−5.926078−04	4.340602−03
.305	9.036270+00	−7.972130+01	8.124037+02	1.550	7.784962−05	−4.818205−04	3.516831−03
.310	7.831999+00	−6.868642+01	6.960926+02	1.600	6.398331−05	−3.946377−04	2.871000−03
.315	6.809384+00	−5.937275+01	5.984718+02	1.650	5.293890−05	−3.254553−04	2.360326−03
.320	5.938019+00	−5.148335+01	5.162298+02	1.700	4.407505−05	−2.701274−04	1.953289−03
.325	5.193057+00	−4.477716+01	4.466937+02	1.750	3.691049−05	−2.255557−04	1.626427−03
.330	4.554119+00	−3.905764+01	3.876960+02	1.800	3.108070−05	−1.894028−04	1.362105−03
.335	4.004424+00	−3.416392+01	3.374722+02	1.850	2.630718−05	−1.598896−04	1.146947−03
.340	3.530103+00	−2.996378+01	2.945797+02	1.900	2.237541−05	−1.356505−04	9.707242−04
.345	3.119648+00	−2.634813+01	2.578346+02	2.000	1.640741−05	−9.900284−05	7.052857−04
.350	2.763479+00	−2.322667+01	2.262616+02	2.100	1.223093−05	−7.348509−05	5.213471−04
.360	2.183283+00	−1.817864+01	1.755438+02	2.200	9.253708−06	−5.537839−05	3.914031−04
.370	1.739715+00	−1.435605+01	1.374767+02	2.300	7.095716−06	−4.230968−05	2.979944−04
.380	1.397380+00	−1.143272+01	1.086107+02	2.400	5.507715−06	−3.273049−05	2.297833−04
.390	1.130829+00	−9.176378+00	8.651104+01	2.500	4.322955−06	−2.560969−05	1.792539−04
.400	9.215582−01	−7.419711+00	6.943891+01	2.600	3.427841−06	−2.024793−05	1.413295−04
.410	7.559744−01	−6.040910+00	5.613891+01	2.700	2.743696−06	−1.616280−05	1.125219−04
.420	6.239949−01	−4.950394+00	4.569504+01	2.800	2.215198−06	−1.301635−05	9.039626−05
.430	5.180716−01	−4.081654+00	3.743241+01	2.900	1.802897−06	−1.056846−05	7.322836−05
.440	4.325047−01	−3.384870+00	3.084920+01	3.000	1.478295−06	−8.646262−06	5.978077−05
.450	3.629556−01	−2.822405+00	2.556896+01	3.100	1.220562−06	−7.123768−06	4.915440−05
.460	3.060953−01	−2.365599+00	2.130702+01	3.200	1.014298−06	−5.908123−06	4.068842−05
.470	2.593516−01	−1.992462+00	1.784637+01	3.300	8.480008−07	−4.930163−06	3.389194−05
.480	2.207225−01	−1.685998+00	1.502038+01	3.400	7.129961−07	−4.137866−06	2.839663−05
.490	1.886402−01	−1.432984+00	1.270020+01	3.500	6.026822−07	−3.491738−06	2.392353−05
.500	1.618684−01	−1.223064+00	1.078550+01	3.600	5.119922−07	−2.961537−06	2.025952−05
.510	1.394273−01	−1.048077+00	9.197699+00	3.700	4.370057−07	−2.523918−06	1.724043−05
.520	1.205352−01	−9.015554−01	7.874850+00	3.800	3.746668−07	−2.160723−06	1.473882−05
.530	1.045654−01	−7.783424−01	6.767843+00	3.900	3.225763−07	−1.857724−06	1.265504−05
.540	9.101292−02	−6.743060−01	5.837527+00	4.000	2.788380−07	−1.603698−06	1.091063−05
.550	7.946861−02	−5.861181−01	5.052529+00	4.250	1.968610−07	−1.128735−06	7.656552−06
.560	6.959958−02	−5.110845−01	4.387579+00	4.500	1.419151−07	−8.114381−07	5.489578−06
.580	5.384748−02	−3.921178−01	3.339838+00	4.750	1.042170−07	−5.943935−07	4.011520−06
.600	4.210888−02	−3.042299−01	2.572082+00	5.000	7.780963−08	−4.427666−07	2.981638−06
.620	3.325615−02	−2.384903−01	2.002202+00	5.250	5.896374−08	−3.348246−07	2.250215−06
.640	2.650574−02	−1.887498−01	1.574140+00	5.500	4.528677−08	−2.566661−07	1.721760−06
.660	2.130546−02	−1.507121−01	1.249039+00	5.750	3.520915−08	−1.991968−07	1.333970−06
.680	1.726109−02	−1.213348−01	9.995962−01	6.000	2.768034−08	−1.563455−07	1.045355−06
.700	1.408769−02	−9.843636−02	8.063706−01	6.250	2.198424−08	−1.239834−07	8.277625−07
.720	1.157702−02	−8.043376−02	6.553555−01	6.500	1.762455−08	−9.925520−08	6.617638−07
.740	9.575225−03	−6.616598−02	5.363441−01	6.750	1.425196−08	−8.015560−08	5.337405−07
.760	7.967537−03	−5.477266−02	4.418201−01	7.000	1.161716−08	−6.525596−08	4.340085−07
.780	6.667527−03	−4.561004−02	3.661936−01	7.250	9.539906−09	−5.352519−08	3.555903−07
.800	5.609540−03	−3.819213−02	3.052684−01	7.500	7.888280−09	−4.420999−08	2.933963−07
.820	4.743290−03	−3.214889−02	2.558675−01	7.750	6.564671−09	−3.675381−08	2.436718−07
.840	4.029963−03	−2.719631−02	2.155648−01	8.000	5.496091−09	−3.074111−08	2.036176−07
.860	3.439377−03	−2.311474−02	1.824941−01	8.250	4.627434−09	−2.585861−08	1.711258−07
.880	2.947904−03	−1.973311−02	1.552085−01	8.500	3.916719−09	−2.186791−08	1.445948−07
.900	2.536919−03	−1.691726−02	1.325789−01	9.000	2.847343−09	−1.587162−08	1.047829−07
.920	2.191651−03	−1.456130−02	1.137181−01	9.500	2.106922−09	−1.172715−08	7.731238−08
.940	1.900317−03	−1.258116−02	9.792470−02	10.000	1.583949−09	−8.804499−09	5.796996−08
.960	1.653465−03	−1.090969−02	8.464077−02	10.500	1.207901−09	−6.705998−09	4.410126−08
.980	1.443468−03	−9.492955−03	7.342007−02	11.000	9.331036−10	−5.174563−09	3.399318−08
1.000	1.264145−03	−8.287405−03	6.390372−02	11.500	7.293370−10	−4.040372−09	2.651589−08
1.025	1.075542−03	−7.024265−03	5.396842−02	12.000	5.762136−10	−3.189036−09	2.090948−08
1.050	9.191857−04	−5.981338−03	4.579675−02	12.500	4.597357−10	−2.542123−09	1.665358−08
1.075	7.888982−04	−5.115680−03	3.903904−02	13.000	3.701359−10	−2.044976−09	1.338605−08
1.100	6.798073−04	−4.393564−03	3.342184−02	13.500	3.004973−10	−1.658938−09	1.085100−08
1.150	5.105185−04	−3.278761−03	2.479242−02	14.000	2.458543−10	−1.356287−09	8.865178−09
1.200	3.887319−04	−2.482104−03	1.866457−02	15.000	1.680709−10	−9.259559−10	6.044671−09
1.250	2.997483−04	−1.903616−03	1.424093−02	16.000	1.178053−10	−6.482627−10	4.227089−09
1.300	2.338062−04	−1.477384−03	1.099935−02	17.000	8.440310−11	−4.639660−10	3.022289−09
1.350	1.843026−04	−1.159122−03	8.591229−03	18.000	6.165493−11	−3.385965−10	2.203613−09
1.400	1.466955−04	−9.185559−04	6.779665−03	19.000	4.582161−11	−2.514262−10	1.634946−09
1.450	1.178112−04	−7.346574−04	5.401029−03	20.000	3.458491−11	−1.896206−10	1.232113−09

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=24$

T^*	I_4	$T^{*2}\frac{\partial I_4}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_4}{\partial T^{*2}}$	T^*	I_4	$T^{*2}\frac{\partial I_4}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_4}{\partial T^{*2}}$
.300	3.241264+00	−3.506965+01	4.254119+02	1.500	1.412954−06	−1.137324−05	1.039872−04
.305	2.711704+00	−2.919046+01	3.523856+02	1.550	1.085619−06	−8.711923−06	7.942101−05
.310	2.277263+00	−2.439233+01	2.930797+02	1.600	8.417595−07	−6.735629−06	6.123447−05
.315	1.919386+00	−2.045980+01	2.447050+02	1.650	6.582598−07	−5.253012−06	4.763077−05
.320	1.623412+00	−1.722352+01	2.050805+02	1.700	5.188817−07	−4.130115−06	3.735616−05
.325	1.377701+00	−1.454975+01	1.724917+02	1.750	4.120843−07	−3.272047−06	2.952537−05
.330	1.172970+00	−1.233233+01	1.455849+02	1.800	3.295752−07	−2.610840−06	2.350620−05
.335	1.001781+00	−1.048667+01	1.232858+02	1.850	2.653355−07	−2.097306−06	1.884244−05
.340	8.581502−01	−8.945036+00	1.047384+02	1.900	2.149535−07	−1.695496−06	1.520158−05
.345	7.372472−01	−7.652984+00	8.925760+01	2.000	1.435428−07	−1.127788−06	1.007327−05
.350	6.351512−01	−6.566551+00	7.629289+01	2.100	9.790430−08	−7.664557−07	6.822144−06
.360	4.752088−01	−4.874769+00	5.621876+01	2.200	6.806119−08	−5.310687−07	4.711919−06
.370	3.591494−01	−3.656876+00	4.187594+01	2.300	4.813884−08	−3.744759−07	3.312774−06
.380	2.740108−01	−2.770214+00	3.150879+01	2.400	3.458719−08	−2.682991−07	2.367025−06
.390	2.109145−01	−2.117863+00	2.393357+01	2.500	2.520988−08	−1.950463−07	1.716412−06
.400	1.637034−01	−1.633133+00	1.834179+01	2.600	1.861860−08	−1.436994−07	1.261578−06
.410	1.280586−01	−1.269589+00	1.417441+01	2.700	1.391841−08	−1.071786−07	9.388809−07
.420	1.009168−01	−9.945339−01	1.104048+01	2.800	1.052195−08	−8.085161−08	7.067971−07
.430	8.008357−02	−7.847019−01	8.663580+00	2.900	8.037267−09	−6.163562−08	5.377702−07
.440	6.397097−02	−6.233719−01	6.846309+00	3.000	6.198782−09	−4.744738−08	4.132244−07
.450	5.141972−02	−4.984125−01	5.446300+00	3.100	4.823950−09	−3.685853−08	3.204542−07
.460	4.157606−02	−4.009443−01	4.359952+00	3.200	3.785635−09	−2.887661−08	2.506512−07
.470	3.380597−02	−3.244122−01	3.511212+00	3.300	2.994196−09	−2.280338−08	1.976316−07
.480	2.763497−02	−2.639386−01	2.843793+00	3.400	2.385696−09	−1.814186−08	1.570028−07
.490	2.270535−02	−2.158665−01	2.315711+00	3.500	1.914038−09	−1.453443−08	1.256099−07
.500	1.874547−02	−1.774334−01	1.895412+00	3.600	1.545647−09	−1.172112−08	1.011638−07
.510	1.554769−02	−1.465387−01	1.559021+00	3.700	1.255836−09	−9.511116−09	8.198701−08
.520	1.295228−02	−1.215744−01	1.288343+00	3.800	1.026293−09	−7.763111−09	6.683935−08
.530	1.083560−02	−1.013017−01	1.069428+00	3.900	8.433148−10	−6.371537−09	5.479576−08
.540	9.101342−03	−8.476047−02	8.915106−01	4.000	6.965663−10	−5.256901−09	4.516072−08
.550	7.674143−03	−7.120244−02	7.462371−01	4.250	4.410838−10	−3.320167−09	2.845104−08
.560	6.494656−03	−6.004113−02	6.270866−01	4.500	2.870033−10	−2.155306−09	1.842734−08
.580	4.700622−03	−4.315645−02	4.477677−01	4.750	1.913107−10	−1.433640−09	1.223211−08
.600	3.446845−03	−3.144019−02	3.241807−01	5.000	1.303068−10	−9.746050−10	8.299978−09
.620	2.558162−03	−2.319127−02	2.377241−01	5.250	9.049545−11	−6.756474−10	5.744130−09
.640	1.919962−03	−1.730487−02	1.764019−01	5.500	6.396018−11	−4.767569−10	4.046851−09
.660	1.456039−03	−1.305156−02	1.323461−01	5.750	4.593230−11	−3.418645−10	2.897631−09
.680	1.114966−03	−9.942337−03	1.003155−01	6.000	3.346926−11	−2.487590−10	2.105637−09
.700	8.615499−04	−7.644667−03	7.676759−02	6.250	2.471514−11	−1.834575−10	1.550948−09
.720	6.713950−04	−5.929426−03	5.927504−02	6.500	1.847579−11	−1.369788−10	1.156669−09
.740	5.273829−04	−4.636758−03	4.615369−02	6.750	1.396863−11	−1.034466−10	8.725686−10
.760	4.173650−04	−3.653833−03	3.622093−02	7.000	1.067208−11	−7.895043−11	6.652658−10
.780	3.326273−04	−2.900140−03	2.863710−02	7.250	8.233073−12	−6.084691−11	5.122284−10
.800	2.668564−04	−2.317637−03	2.279971−02	7.500	6.409141−12	−4.732306−11	3.980219−10
.820	2.154346−04	−1.864073−03	1.827218−02	7.750	5.031519−12	−3.711861−11	3.119300−10
.840	1.749541−04	−1.508410−03	1.473519−02	8.000	3.981275−12	−2.934644−11	2.464181−10
.860	1.428790−04	−1.227653−03	1.195313−02	8.250	3.173611−12	−2.337473−11	1.961256−10
.880	1.173067−04	−1.004620−03	9.750674−03	8.500	2.547403−12	−1.874858−11	1.571967−10
.900	9.679909−05	−8.263770−04	7.996355−03	9.000	1.673114−12	−1.229700−11	1.029664−10
.920	8.026136−05	−6.831159−04	6.590822−03	9.500	1.124743−12	−8.256300−12	6.904902−11
.940	6.685419−05	−5.673448−04	5.458474−03	10.000	7.720126−13	−5.660611−12	4.728869−11
.960	5.592996−05	−4.733044−04	4.541387−03	10.500	5.399329−13	−3.954823−12	3.300528−11
.980	4.698591−05	−3.965385−04	3.794894−03	11.000	3.840856−13	−2.810607−12	2.343441−11
1.000	3.962935−05	−3.335787−04	3.184336−03	11.500	2.774739−13	−2.028668−12	1.690027−11
1.025	3.220263−05	−2.702138−04	2.571662−03	12.000	2.033021−13	−1.485168−12	1.236273−11
1.050	2.631527−05	−2.201490−04	2.089124−03	12.500	1.508963−13	−1.101495−12	9.162235−12
1.075	2.161920−05	−1.803413−04	1.706616−03	13.000	1.133404−13	−8.267637−13	6.872305−12
1.100	1.785130−05	−1.484987−04	1.401537−03	13.500	8.607244−14	−6.274421−13	5.212143−12
1.150	1.234518−05	−1.021609−04	9.593642−04	14.000	6.603353−14	−4.810663−13	3.993805−12
1.200	8.687832−06	−7.154856−05	6.687723−04	15.000	3.995777−14	−2.907711−13	2.411337−12
1.250	6.212051−06	−5.093034−05	4.739974−04	16.000	2.498852−14	−1.816580−13	1.505007−12
1.300	4.506897−06	−3.679636−05	3.410787−04	17.000	1.608514−14	−1.168284−13	9.670606−13
1.350	3.313759−06	−2.694967−05	2.488678−04	18.000	1.062189−14	−7.708556−14	6.375835−13
1.400	2.466647−06	−1.998725−05	1.839236−04	19.000	7.175581−15	−5.203660−14	4.300941−13
1.450	1.857077−06	−1.499639−05	1.375417−04	20.000	4.947267−15	−3.585305−14	2.961410−13

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m = 36$

T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$	T^*	B_0^*	$T^* \frac{\partial B_0^*}{\partial T^*}$	$T^{*2} \frac{\partial^2 B_0^*}{\partial T^{*2}}$
.300	−14.65940	40.28430	−184.79590	1.500	−.26074	1.38526	−3.28852
.305	−14.01284	37.98229	−172.14785	1.550	−.21632	1.32447	−3.13016
.310	−13.41250	35.87770	−160.70990	1.600	−.17517	1.26856	−2.98571
.315	−12.85402	33.94891	−150.33361	1.650	−.13693	1.21697	−2.85347
.320	−12.33350	32.17720	−140.89920	1.700	−.10132	1.16923	−2.73199
.325	−11.84743	30.54626	−132.29991	1.750	−.06807	1.12492	−2.62002
.330	−11.39270	29.04180	−124.44590	1.800	−.03697	1.08368	−2.51651
.335	−10.96654	27.65128	−117.25442	1.850	−.00780	1.04520	−2.42060
.340	−10.56650	26.36360	−110.65850	1.900	.01958	1.00926	−2.33139
.345	−10.19040	25.16897	−104.59418	2.000	.06965	.94392	−2.17073
.350	−9.83630	24.05870	−99.00980	2.100	.11428	.88612	−2.03004
.360	−9.18730	22.06130	−89.09280	2.200	.15429	.83462	−1.90587
.370	−8.60710	20.31930	−80.59050	2.300	.19036	.78844	−1.79550
.380	−8.08590	18.79100	−73.25340	2.400	.22302	.74861	−1.69677
.390	−7.61560	17.44280	−66.88320	2.500	.25273	.70909	−1.60796
.400	−7.18940	16.24740	−61.32110	2.600	.27986	.67474	−1.52765
.410	−6.80152	15.18233	−56.43877	2.700	.30473	.64335	−1.45469
.420	−6.44730	14.22926	−52.13195	2.800	.32760	.61453	−1.38812
.430	−6.12270	13.37279	−48.31515	2.900	.34869	.58800	−1.32715
.440	−5.82426	12.60013	−44.91786	3.000	.36821	.56348	−1.27109
.450	−5.54906	11.90052	−41.88158	3.100	.38631	.54076	−1.21939
.460	−5.29457	11.26485	−39.15748	3.200	.40314	.51964	−1.17155
.470	−5.05861	10.68542	−36.70459	3.300	.41882	.49996	−1.12716
.480	−4.83928	10.15563	−34.48832	3.400	.43347	.48158	−1.08587
.490	−4.63494	9.66981	−32.47935	3.500	.44718	.46438	−1.04735
.500	−4.44415	9.22312	−30.65270	3.600	.46004	.44823	−1.01134
.510	−4.26562	8.81133	−28.98700	3.700	.47211	.43306	−.97761
.520	−4.09825	8.43078	−27.46388	3.800	.48347	.41877	−.94594
.530	−3.94105	8.07829	−26.06748	3.900	.49417	.40529	−.91615
.540	−3.79314	7.75107	−24.78407	4.000	.50427	.39255	−.88808
.550	−3.65373	7.44668	−23.60173	4.250	.52721	.36351	−.82468
.560	−3.52213	7.16294	−22.51003	4.500	.54722	.33811	−.76893
.580	−3.27992	6.65007	−20.56321	4.750	.56489	.31553	−.72000
.600	−3.06222	6.19964	−18.88309	5.000	.58055	.26539	−.67652
.620	−2.86556	5.80149	−17.42246	5.250	.59451	.27730	−.63765
.640	−2.68707	5.44746	−16.14409	5.500	.60703	.26097	−.60269
.660	−2.52438	5.13097	−15.01830	5.750	.61830	.24617	−.57108
.680	−2.37550	4.84661	−14.02124	6.000	.62849	.23266	−.54237
.700	−2.23877	4.58994	−13.13352	6.250	.63775	.22027	−.51622
.720	−2.11278	4.35728	−12.33930	6.500	.64615	.20895	−.49215
.740	−1.99633	4.14556	−11.62551	6.750	.65380	.19855	−.46993
.760	−1.88838	3.95217	−10.98131	7.000	.66087	.18880	−.44969
.780	−1.78805	3.77493	−10.39762	7.250	.66740	.17971	−.43106
.800	−1.69456	3.61197	−9.86683	7.500	.67330	.17147	−.41331
.820	−1.60724	3.46169	−9.38249	7.750	.67869	.16386	−.39660
.840	−1.52551	3.32273	−8.93910	8.000	.68387	.15640	−.38180
.860	−1.44885	3.19388	−8.53199	8.250	.68877	.14927	−.36829
.880	−1.37682	3.07412	−8.15712	8.500	.69295	.14317	−.35423
.900	−1.30900	2.96255	−7.81102	9.000	.70079	.13148	−.32991
.920	−1.24503	2.85839	−7.49067	9.500	.70762	.12105	−.30829
.940	−1.18462	2.76094	−7.19345	10.000	.71358	.11171	−.28895
.960	−1.12746	2.66958	−6.91707	10.500	.71883	.10328	−.27154
.980	−1.07330	2.58379	−6.65932	11.000	.72345	.09564	−.25578
1.000	−1.02193	2.50307	−6.41903	11.500	.72755	.08869	−.24146
1.025	−.96130	2.40868	−6.14006	12.000	.73119	.08233	−.22838
1.050	−.90432	2.32083	−5.88265	12.500	.73443	.07649	−.21639
1.075	−.85068	2.23887	−5.64452	13.000	.73732	.07112	−.20535
1.100	−.80009	2.16225	−5.42366	13.500	.73991	.06615	−.19516
1.150	−.70711	2.02309	−5.02703	14.000	.74223	.06155	−.18572
1.200	−.62366	1.90007	−4.68131	15.000	.74619	.05329	−.16879
1.250	−.54836	1.79056	−4.37761	16.000	.74939	.04608	−.15404
1.300	−.48008	1.69248	−4.10895	17.000	.75199	.03974	−.14107
1.350	−.41789	1.60417	−3.86977	18.000	.75410	.03412	−.12958
1.400	−.36102	1.52425	−3.65562	19.000	.75581	.02910	−.11932
1.450	−.30882	1.45159	−3.46286	20.000	.75719	.02459	−.11011

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=36$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
.300	2.39246	30.33122	−139.9341	887.6048	2.286542+01	−1.568903+02	1.307549+03
.305	2.37277	28.11705	−128.1696	805.2622	2.042278+01	−1.390449+02	1.150792+03
.310	2.35356	26.11964	−117.6753	732.4625	1.829016+01	−1.235857+02	1.015935+03
.315	2.33480	24.31307	−108.2875	667.9051	1.642243+01	−1.101495+02	8.995178+02
.320	2.31649	22.67504	−99.86678	610.4911	1.478184+01	−9.843485+01	7.986862+02
.325	2.29860	21.18627	−92.29377	559.2882	1.333666+01	−8.819020+01	7.110755+02
.330	2.28112	19.83005	−85.46614	513.5025	1.206011+01	−7.920502+01	6.347195+02
.335	2.26404	18.59187	−79.29574	472.4561	1.092957+01	−7.130245+01	5.679767+02
.340	2.24733	17.45908	−73.70644	435.5677	9.925780+00	−6.433333+01	5.094716+02
.345	2.23098	16.42059	−68.63230	402.3377	9.032372+00	−5.817150+01	4.580479+02
.350	2.21499	15.46671	−64.01602	372.3349	8.235338+00	−5.270985+01	4.127299+02
.360	2.18401	13.77963	−55.96360	320.5689	6.884062+00	−4.353561+01	3.372318+02
.370	2.15429	12.34092	−49.22010	277.8364	5.794601+00	−3.622820+01	2.777444+02
.380	2.12576	11.10592	−43.53183	242.2871	4.909184+00	−3.035810+01	2.304516+02
.390	2.09833	10.03930	−38.70130	212.4996	4.184212+00	−2.560505+01	1.925382+02
.400	2.07193	9.112846	−34.57332	187.3713	3.586458+00	−2.172783+01	1.619057+02
.410	2.04651	8.303853	−31.02497	166.0395	3.090367+00	−1.854296+01	1.369740+02
.420	2.02200	7.593913	−27.95803	147.8232	2.676115+00	−1.590970+01	1.165421+02
.430	1.99835	6.967994	−25.29350	132.1810	2.328202+00	−1.371907+01	9.968917+01
.440	1.97551	6.413740	−22.96733	118.6788	2.034411+00	−1.188612+01	8.570339+01
.450	1.95344	5.920928	−20.92726	106.9665	1.785050+00	−1.034404+01	7.403002+01
.460	1.93209	5.481054	−19.13041	96.75971	1.572372+00	−9.039979+00	6.423368+01
.470	1.91142	5.087002	−17.54135	87.82582	1.390148+00	−7.931802+00	5.597018+01
.480	1.89141	4.732785	−16.13065	79.97368	1.233339+00	−6.985724+00	4.896567+01
.490	1.87201	4.413341	−14.87375	73.04522	1.097845+00	−6.174489+00	4.300084+01
.500	1.85319	4.124373	−13.75002	66.90905	9.803091−01	−5.475976+00	3.789906+01
.510	1.83493	3.862212	−12.74207	61.45536	8.779726−01	−4.872139+00	3.351722+01
.520	1.81721	3.623715	−11.83517	56.59200	7.885544−01	−4.348177+00	2.973877+01
.530	1.79998	3.406177	−11.01680	52.24123	7.101603−01	−3.891891+00	2.646827+01
.540	1.78324	3.207263	−10.27624	48.33721	6.412100−01	−3.493178+00	2.362723+01
.550	1.76695	3.024948	−9.604300	44.82392	5.803798−01	−3.143633+00	2.115073+01
.560	1.75110	2.857468	−8.993079	41.65353	5.265559−01	−2.836237+00	1.898490+01
.580	1.72065	2.561058	−7.926352	36.18317	4.363080−01	−2.325258+00	1.541279+01
.600	1.69173	2.307858	−7.031470	31.66150	3.645188−01	−1.923328+00	1.263149+01
.620	1.66422	2.089978	−6.274494	27.89008	3.068576−01	−1.603900+00	1.044229+01
.640	1.63801	1.901225	−5.629276	24.71824	2.601288−01	−1.347616+00	8.701798+00
.660	1.61300	1.736693	−5.075448	22.03019	2.219458−01	−1.140180+00	7.305190+00
.680	1.58910	1.592452	−4.596980	19.73600	1.905060−01	−9.709084−01	6.174868+00
.700	1.56623	1.465333	−4.181136	17.76513	1.644338−01	−8.317315−01	5.252744+00
.720	1.54433	1.352754	−3.817708	16.06170	1.426689−01	−7.164893−01	4.494867+00
.740	1.52332	1.252600	−3.498444	14.58108	1.243869−01	−6.204358−01	3.867653+00
.760	1.50314	1.163120	−3.216626	13.28736	1.089413−01	−5.398818−01	3.345202+00
.780	1.48374	1.082862	−2.966743	12.15135	9.582083−02	−4.719354−01	2.907368+00
.800	1.46508	1.010609	−2.744243	11.14925	8.461853−02	−4.143121−01	2.538349+00
.820	1.44710	.9453366	−2.545344	10.26144	7.500790−02	−3.651938−01	2.225657+00
.840	1.42977	.8861799	−2.366885	9.471702	6.672536−02	−3.231237−01	1.959355+00
.860	1.41305	.8324015	−2.206208	8.766515	5.955681−02	−2.869268−01	1.731477+00
.880	1.39690	.7833716	−2.061067	8.134566	5.332728−02	−2.556494−01	1.535600+00
.900	1.38129	.7385497	−1.929554	7.566329	4.789300−02	−2.285131−01	1.366511+00
.920	1.36619	.6974694	−1.810042	7.053742	4.313520−02	−2.048790−01	1.219957+00
.940	1.35158	.6597270	−1.701137	6.589956	3.895530−02	−1.842198−01	1.092446+00
.960	1.33743	.6249715	−1.601636	6.169119	3.527105−02	−1.660985−01	9.811007−01
.980	1.32371	.5928968	−1.510503	5.786215	3.201352−02	−1.501507−01	8.835341−01
1.000	1.31041	.5632347	−1.426838	5.436924	2.912473−02	−1.360716−01	7.977592−01
1.025	1.29433	.5291937	−1.331573	5.041941	2.595832−02	−1.207141−01	7.046163−01
1.050	1.27882	.4981569	−1.245441	4.687456	2.321228−02	−1.074644−01	6.246446−01
1.075	1.26387	.4697812	−1.167324	4.368228	2.082129−02	−9.598513−02	5.556786−01
1.100	1.24942	.4437713	−1.096268	4.079825	1.873161−02	−8.600013−02	4.959560−01
1.150	1.22196	.3978599	−.9721832	3.580964	1.528561−02	−6.964312−02	3.987237−01
1.200	1.19623	.3587499	−.8679052	3.166780	1.259994−02	−5.700268−02	3.241760−01
1.250	1.17206	.3251614	−.7794634	2.819417	1.048156−02	−4.711007−02	2.662601−01
1.300	1.14930	.2961015	−.7038273	2.525432	8.792282−03	−3.927852−02	2.207221−01
1.350	1.12782	.2707907	−.6386536	2.274563	7.431674−03	−3.301330−02	1.845227−01
1.400	1.10749	.2486101	−.5821084	2.058873	6.325721−03	−2.795282−02	1.554571−01
1.450	1.08823	.2290635	−.5327406	1.872153	5.419174−03	−2.382922−02	1.319042−01

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m = 36$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
1.50	1.06994	.2117490	−.4893897	1.709489	4.670261−03	−2.044152−02	1.126553−01
1.55	1.05254	.1963389	−.4511206	1.566963	4.047128−03	−1.763746−02	9.680079−02
1.60	1.03597	.1825629	−.4171710	1.441411	3.525173−03	−1.530019−02	8.364670−02
1.65	1.02015	.1701977	−.3869170	1.330266	3.085242−03	−1.333934−02	7.265918−02
1.70	1.00504	.1590566	−.3598421	1.231420	2.712290−03	−1.168429−02	6.342350−02
1.75	.99057	.1489827	−.3355172	1.143139	2.394401−03	−1.027943−02	5.561464−02
1.80	.97672	.1398436	−.3135827	1.063978	2.122066−03	−9.080609−03	4.897578−02
1.85	.96343	.1315268	−.2937360	.9927318	1.887642−03	−8.052516−03	4.330245−02
1.90	.95067	.1239364	−.2757205	.9283853	1.684943−03	−7.166710−03	3.843070−02
2.00	.92660	.1106161	−.2443418	.8170882	1.355488−03	−5.733976−03	3.058729−02
2.10	.90427	.09934915	−.2180474	.7246361	1.103278−03	−4.643913−03	2.465463−02
2.20	.88348	.08973313	−.1957959	.6470188	9.074849−04	−3.802441−03	2.009937−02
2.30	.86406	.08145959	−.1767988	.5812343	7.535619−04	−3.144327−03	1.655417−02
2.40	.84586	.07428901	−.1604509	.5250010	6.311664−04	−2.623499−03	1.376119−02
2.50	.82877	.06803305	−.1462812	.4765597	5.328248−04	−2.206864−03	1.153630−02
2.60	.81268	.06254203	−.1339189	.4345374	4.530566−04	−1.870293−03	9.745929−03
2.70	.79749	.05769570	−.1230690	.3978499	3.877881−04	−1.595944−03	8.291813−03
2.80	.78312	.05339657	−.1134939	.3656320	3.339540−04	−1.370457−03	7.100701−03
2.90	.76950	.04956497	−.1050013	.3371868	2.892212−04	−1.183710−03	6.117337−03
3.00	.75656	.04613524	−.09743365	.3119478	2.517953−04	−1.027949−03	5.299563−03
3.10	.74426	.04305285	−.09066109	.2894509	2.202828−04	−8.971811−04	4.614905−03
3.20	.73254	.04027226	−.08457576	.2693126	1.935909−04	−7.867198−04	4.038080−03
3.30	.72135	.03775517	−.07908758	.2512146	1.708571−04	−6.928812−04	3.549265−03
3.40	.71067	.03546914	−.07412065	.2348900	1.513938−04	−6.127376−04	3.132760−03
3.50	.70044	.03338665	−.06961089	.2201145	1.346493−04	−5.439477−04	2.776047−03
3.60	.69064	.03148412	−.06550368	.2066978	1.201777−04	−4.846256−04	2.469073−03
3.70	.68125	.02974131	−.06175239	.1944782	1.076168−04	−4.332421−04	2.203706−03
3.80	.67222	.02814075	−.05831693	.1833173	9.666994−05	−3.885495−04	1.973329−03
3.90	.66355	.02666730	−.05516272	.1730960	8.709312−05	−3.495237−04	1.772523−03
4.00	.65520	.02530779	−.05225977	.1637116	7.868449−05	−3.153195−04	1.596828−03
4.25	.63564	.02233547	−.04593857	.1433554	6.173863−05	−2.465828−04	1.244708−03
4.50	.61773	.01986234	−.04070718	.1265949	4.915436−05	−1.957328−04	9.851711−04
4.75	.60126	.01778214	−.03632802	.1126289	3.964493−05	−1.574396−04	7.903674−04
5.00	.58603	.01601549	−.03262499	.1008679	3.234685−05	−1.281424−04	6.417726−04
5.25	.57191	.01450215	−.02946531	.09087004	2.666764−05	−1.054085−04	5.267787−04
5.50	.55876	.01319570	−.02674728	.08229886	2.219266−05	−8.754121−05	4.366257−04
5.75	.54648	.01205991	−.02439200	.07489462	1.862645−05	−7.333611−05	3.651138−04
6.00	.53497	.01106618	−.02233743	.06845413	1.575508−05	−6.192363−05	3.077808−04
6.25	.52416	.01019166	−.02053430	.06281665	1.342133−05	−5.266666−05	2.613665−04
6.50	.51398	.009417927	−.01894303	.05785362	1.150814−05	−4.509202−05	2.234554−04
6.75	.50438	.008730000	−.01753156	.05346127	9.927218−06	−3.884373−05	1.922349−04
7.00	.49529	.008115584	−.01627368	.04955505	8.611268−06	−3.365112−05	1.663296−04
7.25	.48667	.007564515	−.01514779	.04606554	7.508419−06	−2.930596−05	1.446837−04
7.50	.47849	.007068335	−.01413598	.04293532	6.578322−06	−2.564663−05	1.264792−04
7.75	.47071	.006619953	−.01322327	.04011652	5.789303−06	−2.254648−05	1.110762−04
8.00	.46330	.006213392	−.01239708	.03756901	5.116285−06	−1.990543−05	9.797003−05
8.25	.45622	.005843580	−.01164676	.03525894	4.539266−06	−1.764376−05	8.675933−05
8.50	.44947	.005506197	−.01096326	.03315757	4.042168−06	−1.569753−05	7.712254−05
9.00	.43680	.004914421	−.009766832	.02948643	3.238125−06	−1.255433−05	6.158172−05
9.50	.42515	.004414136	−.008757935	.02639820	2.626182−06	−1.016666−05	4.979806−05
10.00	.41439	.003987324	−.007899171	.02377525	2.153503−06	−8.325542−06	4.072685−05
10.50	.40440	.003620204	−.007162038	.02152824	1.783518−06	−6.886682−06	3.364826−05
11.00	.39510	.003302090	−.006524508	.01958835	1.490426−06	−5.748492−06	2.805655−05
11.50	.38642	.003024589	−.005969331	.01790183	1.255713−06	−4.838203−06	2.359014−05
12.00	.37828	.002781039	−.005482848	.01642622	1.065881−06	−4.102870−06	1.998637−05
12.50	.37064	.002566089	−.005054124	.01512762	9.109534−07	−3.503412−06	1.705166−05
13.00	.36344	.002375410	−.004674321	.01397869	7.834572−07	−3.010605−06	1.464148−05
13.50	.35665	.002205460	−.004336235	.01295718	6.777282−07	−2.602328−06	1.264657−05
14.00	.35022	.002053326	−.004033944	.01204484	5.894281−07	−2.261660−06	1.098345−05
15.00	.33835	.001793224	−.003517937	.01048983	4.524138−07	−1.733684−06	8.408888−06
16.00	.32760	.001580094	−.003095929	.009220422	3.533375−07	−1.352467−06	6.552628−06
17.00	.31782	.001403217	−.002746301	.008170439	2.801963−07	−1.071412−06	5.185827−06
18.00	.30887	.001254775	−.002453326	.007291867	2.252091−07	−8.603654−07	4.160649−06
19.00	.30063	.001128955	−.002205338	.006549166	1.831970−07	−6.992897−07	3.379009−06
20.00	.29302	.001021361	−.001993533	.005915574	1.506324−07	−5.745553−07	2.774280−06

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=36$

T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$	T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$
.300	1.089813+01	−9.703553+01	9.966130+02	1.500	8.970483−05	−5.663495−04	4.200853−03
.305	9.410824+00	−8.328906+01	8.506390+02	1.550	7.295596−05	−4.590602−04	3.394012−03
.310	8.152881+00	−7.173376+01	7.286300+02	1.600	5.976387−05	−3.748626−04	2.763044−03
.315	7.085093+00	−6.198374+01	6.262524+02	1.650	4.928791−05	−3.082304−04	2.265359−03
.320	6.175575+00	−5.372721+01	5.400247+02	1.700	4.090503−05	−2.550845−04	1.869646−03
.325	5.398288+00	−4.671108+01	4.671370+02	1.750	3.414885−05	−2.123835−04	1.552645−03
.330	4.731877+00	−4.072906+01	4.053114+02	1.800	2.866703−05	−1.778379−04	1.296910−03
.335	4.158766+00	−3.561231+01	3.526936+02	1.850	2.419103−05	−1.497091−04	1.089232−03
.340	3.664428+00	−3.122210+01	3.077681+02	1.900	2.051451−05	−1.266655−04	9.195308−04
.345	3.236817+00	−2.744402+01	2.692913+02	2.000	1.495589−05	−9.195064−05	6.647649−04
.350	2.865905+00	−2.418335+01	2.362390+02	2.100	1.108646−05	−6.789605−05	4.890137−04
.360	2.262037+00	−1.891263+01	1.831654+02	2.200	8.342277−06	−5.090820−05	3.653970−04
.370	1.800732+00	−1.492394+01	1.433513+02	2.300	6.363121−06	−3.870348−05	2.769162−04
.380	1.444990+00	−1.187555+01	1.131766+02	2.400	4.913787−06	−2.979770−05	2.125732−04
.390	1.168220+00	−9.524205+00	9.008758+01	2.500	3.837589−06	−2.320647−05	1.651035−04
.400	9.511009−01	−7.694771+00	7.226092+01	2.600	3.028237−06	−1.826465−05	1.296176−04
.410	7.794452−01	−6.259801+00	5.838075+01	2.700	2.412416−06	−1.451517−05	1.027673−04
.420	6.427369−01	−5.125613+00	4.748736+01	2.800	1.938779−06	−1.163901−05	8.222362−05
.430	5.331073−01	−4.222684+00	3.887391+01	2.900	1.570857−06	−9.410343−06	6.634286−05
.440	4.446189−01	−3.498964+00	3.201505+01	3.000	1.282398−06	−7.667070−06	5.394876−05
.450	3.727538−01	−2.915149+00	2.651685+01	3.100	1.054298−06	−6.291573−06	4.419005−05
.460	3.140484−01	−2.441325+00	2.208151+01	3.200	8.724767−07	−5.197396−06	3.644263−05
.470	2.658276−01	−2.054550+00	1.848213+01	3.300	7.264576−07	−4.320374−06	3.024444−05
.480	2.260107−01	−1.737102+00	1.554454+01	3.400	6.083674−07	−3.612397−06	2.524979−05
.490	1.929691−01	−1.475199+00	1.313413+01	3.500	5.122351−07	−3.037060−06	2.119771−05
.500	1.654198−01	−1.258053+00	1.114614+01	3.600	4.334930−07	−2.566575−06	1.788936−05
.510	1.423460−01	−1.077167+00	9.498516+00	3.700	3.686192−07	−2.179556−06	1.517204−05
.520	1.229373−01	−9.258111−01	8.126635+00	3.800	3.148769−07	−1.859421−06	1.292756−05
.530	1.065445−01	−7.986204−01	6.979269+00	3.900	2.701248−07	−1.593215−06	1.106372−05
.540	9.264450−02	−6.913001−01	6.015605+00	4.000	2.326754−07	−1.370749−06	9.508155−06
.550	8.081402−02	−6.003915−01	5.202949+00	4.250	1.628730−07	−9.569646−07	6.620741−06
.560	7.070875−02	−5.230969−01	4.514980+00	4.500	1.164591−07	−6.826206−07	4.711710−06
.580	5.459910−02	−4.006704−01	3.431918+00	4.750	8.485738−08	−4.963140−07	3.418556−06
.600	4.261392−02	−3.103515−01	2.639212+00	5.000	6.288225−08	−3.670649−07	2.523484−06
.620	3.359016−02	−2.428883−01	2.051524+00	5.250	4.730971−08	−2.756692−07	1.891867−06
.640	2.672066−02	−1.919148−01	1.610613+00	5.500	3.608478−08	−2.099184−07	1.438338−06
.660	2.143733−02	−1.529884−01	1.276158+00	5.750	2.786788−08	−1.618737−07	1.107518−06
.680	1.733509−02	−1.229667−01	1.019846+00	6.000	2.176790−08	−1.262657−07	8.627252−07
.700	1.412152−02	−9.959836−02	8.215376−01	6.250	1.718091−08	−9.953044−08	6.792026−07
.720	1.158318−02	−8.125182−02	6.667366−01	6.500	1.369083−08	−7.921739−08	5.399566−07
.740	9.562594−03	−6.673154−02	5.448882−01	6.750	1.100640−08	−6.361395−08	4.331320−07
.760	7.942415−03	−5.515256−02	4.482270−01	7.000	8.920855−09	−5.150650−08	3.503406−07
.780	6.634393−03	−4.585341−02	3.709832−01	7.250	7.285481−09	−4.202338−08	2.855670−07
.800	5.571573−03	−3.833527−02	3.088295−01	7.500	5.992002−09	−3.453091−08	2.344439−07
.820	4.702738−03	−3.221871−02	2.584925−01	7.750	4.960690−09	−2.856308−08	1.937640−07
.840	3.988402−03	−2.721284−02	2.174751−01	8.000	4.132216−09	−2.377357−08	1.611463−07
.860	3.397903−03	−2.309293−02	1.838578−01	8.250	3.461997−09	−1.990244−08	1.348060−07
.880	2.907260−03	−1.968412−02	1.561541−01	8.500	2.916219−09	−1.675275−08	1.133923−07
.900	2.497600−03	−1.684943−02	1.332048−01	9.000	2.100450−09	−1.205033−08	8.145783−08
.920	2.153971−03	−1.448088−02	1.141000−01	9.500	1.540574−09	−8.827676−09	5.960343−08
.940	1.864459−03	−1.249278−02	9.812100−02	10.000	1.148434−09	−6.573486−09	4.433623−08
.960	1.619520−03	−1.081681−02	8.469666−02	10.500	8.687249−10	−4.967515−09	3.347195−08
.980	1.411462−03	−9.398116−03	7.337052−02	11.000	6.658999−10	−3.804255−09	2.561094−08
1.000	1.234058−03	−8.192476−03	6.377587−02	11.500	5.166138−10	−2.948915−09	1.983643−08
1.025	1.047782−03	−6.931071−03	5.377172−02	12.000	4.052293−10	−2.311324−09	1.553583−08
1.050	8.936360−04	−5.891252−03	4.555520−02	12.500	3.210828−10	−1.830060−09	1.229237−08
1.075	7.654231−04	−5.029553−03	3.877009−02	13.000	2.567825−10	−1.462596−09	9.817774−09
1.100	6.582620−04	−4.311881−03	3.313810−02	13.500	2.071272−10	−1.179035−09	7.909565−09
1.150	4.923977−04	−3.206473−03	2.450365−02	14.000	1.684059−10	−9.580649−10	6.423560−09
1.200	3.734919−04	−2.418982−03	1.838932−02	15.000	1.137591−10	−6.464976−10	4.330147−09
1.250	2.869116−04	−1.848900−03	1.398757−02	16.000	7.884474−11	−4.476609−10	2.995651−09
1.300	2.229669−04	−1.430128−03	1.077080−02	17.000	5.589153−11	−3.170752−10	2.120086−09
1.350	1.751220−04	−1.118365−03	8.387520−03	18.000	4.041788−11	−2.291218−10	1.530886−09
1.400	1.388933−04	−8.833992−04	6.599386−03	19.000	2.975147−11	−1.685425−10	1.125386−09
1.450	1.111569−04	−7.042997−04	5.242137−03	20.000	2.225107−11	−1.259758−10	8.406618−10

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=36$

T^*	I_4	$T^*\frac{\partial I_4}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_4}{\partial T^{*2}}$	T^*	I_4	$T^*\frac{\partial I_4}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_4}{\partial T^{*2}}$
.300	3.552717+00	−3.867929+01	4.715396+02	1.500	1.286044−06	−1.056132−05	9.819524−05
.305	2.968936+00	−3.216256+01	3.902382+02	1.550	9.828147−07	−8.048868−06	7.463457−05
.310	2.490493+00	−2.684891+01	3.242660+02	1.600	7.580511−07	−6.192005−06	5.727121−05
.315	2.096764+00	−2.249778+01	2.704977+02	1.650	5.897554−07	−4.805488−06	4.434079−05
.320	1.771467+00	−1.892023+01	2.264911+02	1.700	4.625439−07	−3.760183−06	3.461719−05
.325	1.501681+00	−1.596714+01	1.903278+02	1.750	3.655313−07	−2.964996−06	2.723802−05
.330	1.277114+00	−1.352028+01	1.604939+02	1.800	2.909305−07	−2.354947−06	2.158979−05
.335	1.089525+00	−1.148545+01	1.357889+02	1.850	2.331130−07	−1.883198−06	1.723150−05
.340	9.322898−01	−9.787319+00	1.152570+02	1.900	1.879711−07	−1.515654−06	1.384291−05
.345	8.000649−01	−8.365360+00	9.813361+01	2.000	1.243911−07	−9.994718−07	9.097224−06
.350	6.885188−01	−7.170759+00	8.380474+01	2.100	8.410269−08	−6.735930−07	6.111915−06
.360	5.140212−01	−5.312920+00	6.164439+01	2.200	5.797445−08	−4.629645−07	4.188731−06
.370	3.876467−01	−3.977827+00	4.583621+01	2.300	4.067070−08	−3.239056−07	2.922859−06
.380	2.951207−01	−3.007536+00	3.442800+01	2.400	2.899096−08	−2.303114−07	2.073229−06
.390	2.266814−01	−2.294893+00	2.610526+01	2.500	2.096932−08	−1.662009−07	1.492745−06
.400	1.755705−01	−1.766276+00	1.997133+01	2.600	1.537182−08	−1.215743−07	1.089641−06
.410	1.370545−01	−1.370495+00	1.540704+01	2.700	1.140842−08	−9.004772−08	8.055017−07
.420	1.077820−01	−1.071561+00	1.197996+01	2.800	8.564002−09	−6.747026−08	6.024398−07
.430	8.535522−02	−8.438989−01	9.384752+00	2.900	6.497053−09	−5.109660−08	4.554609−07
.440	6.804251−02	−6.691547−01	7.403618+00	3.000	4.977597−09	−3.908246−08	3.478119−07
.450	5.458138−02	−5.340318−01	5.879705+00	3.100	3.848533−09	−3.017078−08	2.680981−07
.460	4.404352−02	−4.288114−01	4.699012+00	3.200	3.001098−09	−2.349304−08	2.084630−07
.470	3.574065−02	−3.463291−01	3.777958+00	3.300	2.359050−09	−1.844164−08	1.634203−07
.480	2.915848−02	−2.812610−01	3.054764+00	3.400	1.868319−09	−1.458642−08	1.290933−07
.490	2.390987−02	−2.296210−01	2.483406+00	3.500	1.490134−09	−1.161952−08	1.027119−07
.500	1.970130−02	−1.884025−01	2.029342+00	3.600	1.196414−09	−9.318307−09	8.227612−08
.510	1.630874−02	−1.553224−01	1.666464+00	3.700	9.666195−10	−7.520194−09	6.632767−08
.520	1.356010−02	−1.286350−01	1.374903+00	3.800	7.855930−10	−6.105376−09	5.379350−08
.530	1.132238−02	−1.069976−01	1.139444+00	3.900	6.420509−10	−4.984795−09	4.387706−08
.540	9.492152−03	−8.937092−02	9.483601−01	4.000	5.275260−10	−4.091710−09	3.598219−08
.550	7.988579−03	−7.494596−02	7.925615−01	4.250	3.298024−10	−2.552419−09	2.239718−08
.560	6.748112−03	−6.308959−02	6.649626−01	4.500	2.119975−10	−1.637438−09	1.434040−08
.580	4.866029−03	−4.519415−02	4.733296−01	4.750	1.396787−10	−1.076922−09	9.414952−09
.600	3.555103−03	−3.281440−02	3.416268−01	5.000	9.408499−11	−7.242130−10	6.321320−09
.620	2.629026−03	−2.412502−02	2.497526−01	5.250	6.464562−11	−4.968662−10	4.330612−09
.640	1.966156−03	−1.794295−02	1.847683−01	5.500	4.522331−11	−3.471132−10	3.021359−09
.660	1.485863−03	−1.348928−02	1.382097−01	5.750	3.215720−11	−2.465148−10	2.143097−09
.680	1.133884−03	−1.024314−02	1.044513−01	6.000	2.320963−11	−1.777177−10	1.543257−09
.700	8.731914−04	−7.851258−03	7.969977−02	6.250	1.698208−11	−1.298937−10	1.126784−09
.720	6.781867−04	−6.070807−03	6.136195−02	6.500	1.258260−11	−9.614693−11	8.332304−10
.740	5.309565−04	−4.732799−03	4.764268−02	6.750	9.431594−12	−7.200251−11	6.234237−10
.760	4.188224−04	−3.718250−03	3.728430−02	7.000	7.145972−12	−5.450643−11	4.715365−10
.780	3.327143−04	−2.942464−03	2.939584−02	7.250	5.468455−12	−4.167723−11	3.602648−10
.800	2.660780−04	−2.344528−03	2.333943−02	7.500	4.223727−12	−3.216618−11	2.778426−10
.820	2.141324−04	−1.880209−03	1.865386−02	7.750	3.290679−12	−2.504253−11	2.161590−10
.840	1.733581−04	−1.517089−03	1.500253−02	8.000	2.584582−12	−1.965577−11	1.695502−10
.860	1.411427−04	−1.231204−03	1.213763−02	8.250	2.045454−12	−1.554579−11	1.340141−10
.880	1.155312−04	−1.004693−03	9.875129−03	8.500	1.630360−12	−1.238354−11	1.066907−10
.900	9.504966−05	−8.241407−04	8.077340−03	9.000	1.056427−12	−8.015264−12	6.898051−11
.920	7.857860−05	−6.793953−04	6.640428−03	9.500	7.010919−13	−5.313948−12	4.568766−11
.940	6.526197−05	−5.627218−04	5.485545−03	10.000	4.753438−13	−3.599600−12	3.092063−11
.960	5.444087−05	−4.681865−04	4.552404−03	10.500	3.285613−13	−2.486003−12	2.133743−11
.980	4.560492−05	−3.912084−04	3.794607−03	11.000	2.311050−13	−1.747286−12	1.498582−11
1.000	3.835650−05	−3.282300−04	3.176231−03	11.500	1.651592−13	−1.247823−12	1.069478−11
1.025	3.106028−05	−2.650185−04	2.557291−03	12.000	1.197570−13	−9.042123−13	7.744867−12
1.050	2.529504−05	−2.152250−04	2.071191−03	12.500	8.799992−14	−6.640357−13	5.684341−12
1.075	2.071101−05	−1.757506−04	1.686931−03	13.000	6.546165−14	−4.936900−13	4.223829−12
1.100	1.704455−05	−1.442672−04	1.381300−03	13.500	4.925021−14	−3.712361−13	3.174546−12
1.150	1.171062−05	−9.864344−05	9.400617−04	14.000	3.744413−14	−2.821080−13	2.411242−12
1.200	8.189066−06	−6.867348−05	6.516277−04	15.000	2.227090−14	−1.676438−13	1.431656−12
1.250	5.819278−06	−4.859951−05	4.593059−04	16.000	1.370361−14	−1.030734−13	8.795627−13
1.300	4.196522−06	−3.491300−05	3.287298−04	17.000	8.686959−15	−6.529475−14	5.568052−13
1.350	3.067425−06	−2.542844−05	2.385960−04	18.000	5.653821−15	−4.246999−14	3.619448−13
1.400	2.270187−06	−1.875673−05	1.754247−04	19.000	3.767110−15	−2.828162−14	2.408936−13
1.450	1.699588−06	−1.399849−05	1.305250−04	20.000	2.563368−15	−1.923470−14	1.637530−13

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m = 36$

T^*	I_5	$T^* \frac{\partial I_5}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_5}{\partial T^{*2}}$	T^*	I_5	$T^* \frac{\partial I_5}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_5}{\partial T^{*2}}$
.300	8.415836−01	−1.080607+01	1.523791+02	1.500	1.396721−08	−1.409782−07	1.574207−06
.305	6.809591−01	−8.706192+00	1.222627+02	1.550	1.003561−08	−1.010562−07	1.125828−06
.310	5.533785−01	−7.045604+00	9.854655+01	1.600	7.292117−09	−7.326705−08	8.144689−07
.315	4.515741−01	−5.726160+00	7.977955+01	1.650	5.354530−09	−5.368660−08	5.955807−07
.320	3.699758−01	−4.672979+00	6.485932+01	1.700	3.970625−09	−3.973214−08	4.399199−07
.325	3.042922−01	−3.828628+00	5.294388+01	1.750	2.971695−09	−2.968050−08	3.280226−07
.330	2.512005−01	−3.148826+00	4.338675+01	1.800	2.243464−09	−2.236719−08	2.467662−07
.335	2.081156−01	−2.599265+00	3.568907+01	1.850	1.707597−09	−1.699580−08	1.871954−07
.340	1.730168−01	−2.153240+00	2.946402+01	1.900	1.309796−09	−1.301546−08	1.431287−07
.345	1.443177−01	−1.789869+00	2.441027+01	2.000	7.873676−10	−7.800613−09	8.553000−08
.350	1.207673−01	−1.492744+00	2.029199+01	2.100	4.858924−10	−4.800662−09	5.249585−08
.360	8.535276−02	−1.048166+00	1.415945+01	2.200	3.070300−10	−3.025877−09	3.300704−08
.370	6.103004−02	−7.448447−01	1.000202+01	2.300	1.982181−10	−1.948994−09	2.121205−08
.380	4.411742−02	−5.352618−01	7.146814+00	2.400	1.304964−10	−1.280382−09	1.390605−08
.390	3.222019−02	−3.887174−01	5.161966+00	2.500	8.746280−11	−8.564582−10	9.283870−09
.400	2.375929−02	−2.850999−01	3.766314+00	2.600	5.959124−11	−5.824623−10	6.302443−09
.410	1.768011−02	−2.110605−01	2.774349+00	2.700	4.122070−11	−4.022145−10	4.344805−09
.420	1.326969−02	−1.576287−01	2.062124+00	2.800	2.891513−11	−2.816912−10	3.038121−09
.430	1.004053−02	−1.187060−01	1.545830+00	2.900	2.054797−11	−1.998789−10	2.152589−09
.440	7.655710−03	−9.010008−02	1.168164+00	3.000	1.477919−11	−1.435617−10	1.543953−09
.450	5.879945−03	−6.889930−02	8.895235−01	3.100	1.075014−11	−1.042865−10	1.120109−09
.460	4.547363−03	−5.306110−02	6.822653−01	3.200	7.902024−12	−7.656163−11	8.213211−10
.470	3.539939−03	−4.113926−02	5.269073−01	3.300	5.865881−12	−5.676690−11	6.082692−10
.480	2.772959−03	−3.210062−02	4.095948−01	3.400	4.394759−12	−4.248287−11	4.547162−10
.490	2.185114−03	−2.520083−02	3.203894−01	3.500	3.321269−12	−3.207192−11	3.429275−10
.500	1.731682−03	−1.989930−02	2.521037−01	3.600	2.530585−12	−2.441224−11	2.607706−10
.510	1.379792−03	−1.580036−02	1.994985−01	3.700	1.943056−12	−1.872661−11	1.998505−10
.520	1.105112−03	−1.261234−02	1.587265−01	3.800	1.502842−12	−1.447086−11	1.542960−10
.530	8.895050−04	−1.011866−02	1.269420−01	3.900	1.170403−12	−1.126010−11	1.199597−10
.540	7.193631−04	−8.157457−03	1.020260−01	4.000	9.174783−13	−8.819530−12	9.388324−11
.550	5.844127−04	−6.606980−03	8.239029−02	4.250	5.125584−13	−4.917769−12	5.225176−11
.560	4.768505−04	−5.375077−03	6.683674−02	4.500	2.963307−13	−2.838318−12	3.010697−11
.580	3.214262−04	−3.602806−03	4.455549−02	4.750	1.766217−13	−1.689118−12	1.788997−11
.600	2.200333−04	−2.453306−03	3.018444−02	5.000	1.081818−13	−1.033149−12	1.092740−11
.620	1.527947−04	−1.695152−03	2.075581−02	5.250	6.790842−14	−6.477075−13	6.842093−12
.640	1.075220−04	−1.187289−03	1.447122−02	5.500	4.358508−14	−4.152273−13	4.381247−12
.660	7.660497−05	−8.421453−04	1.022023−02	5.750	2.854437−14	−2.716451−13	2.863225−12
.680	5.521143−05	−6.044108−04	7.305167−03	6.000	1.904185−14	−1.810339−13	1.906296−12
.700	4.022432−05	−4.385909−04	5.280475−03	6.250	1.291924−14	−1.227124−13	1.291002−12
.720	2.960344−05	−3.215642−04	3.857277−03	6.500	8.902590−15	−8.448842−14	8.881196−13
.740	2.199488−05	−2.380578−04	2.845595−03	6.750	6.223408−15	−5.901516−14	6.198670−13
.760	1.648856−05	−1.778498−04	2.118819−03	7.000	4.408702−15	−4.177566−14	4.384713−13
.780	1.246529−05	−1.340146−04	1.591511−03	7.250	3.161924−15	−2.994069−14	3.140383−13
.800	9.498955−06	−1.018051−04	1.205330−03	7.500	2.293933−15	−2.170737−14	2.275356−13
.820	7.293143−06	−7.793131−05	9.199968−04	7.750	1.682154−15	−1.590836−14	1.666500−13
.840	5.639567−06	−6.009008−05	7.074065−04	8.000	1.245965−15	−1.177644−14	1.232954−13
.860	4.390449−06	−4.665285−05	5.477561−04	8.250	9.315991−16	−8.800344−15	9.208714−14
.880	3.439982−06	−3.645749−05	4.269589−04	8.500	7.027280−16	−6.634882−15	6.939238−14
.900	2.711753−06	−2.866739−05	3.349057−04	9.000	4.097562−16	−3.865064−15	4.038570−14
.920	2.150125−06	−2.267526−05	2.642796−04	9.500	2.461127−16	−2.319480−15	2.421550−14
.940	1.714266−06	−1.803674−05	2.097422−04	10.000	1.518007−16	−1.429520−15	1.491279−14
.960	1.373989−06	−1.442424−05	1.673687−04	10.500	9.589678−17	−9.024235−16	9.407499−15
.980	1.106818−06	−1.159448−05	1.342521−04	11.000	6.190781−17	−5.821938−16	6.065296−15
1.000	8.959015−07	−9.365590−06	1.082248−04	11.500	4.076155−17	−3.830994−16	3.988769−15
1.025	6.923006−07	−7.219203−06	8.321982−05	12.000	2.732638−17	−2.566856−16	2.671109−15
1.050	5.386330−07	−5.603434−06	6.444412−05	12.500	1.862487−17	−1.748594−16	1.818693−15
1.075	4.217972−07	−4.377998−06	5.023874−05	13.000	1.288886−17	−1.209490−16	1.257385−15
1.100	3.323434−07	−3.441997−06	3.941376−05	13.500	9.045680−18	−8.484681−17	8.816807−16
1.150	2.099234−07	−2.165214−06	2.469428−05	14.000	6.431688−18	−6.030292−17	6.263778−16
1.200	1.354505−07	−1.391788−06	1.581464−05	15.000	3.368990−18	−3.156346−17	3.276120−16
1.250	8.911174−08	−9.124318−07	1.033225−05	16.000	1.840739−18	−1.723402−17	1.787624−16
1.300	5.967790−08	−6.090597−07	6.874918−06	17.000	1.043663−18	−9.765523−18	1.012349−16
1.350	4.062490−08	−4.133480−07	4.651900−06	18.000	6.114334−19	−5.718104−18	5.924591−17
1.400	2.807497−08	−2.848437−07	3.196778−06	19.000	3.688147−19	−3.447475−18	3.570270−17
1.450	1.967453−08	−1.990828−07	2.228471−06	20.000	2.283636−19	−2.133679−18	2.208725−17

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m=36$

T^*	I_6	$T^*\frac{\partial I_6}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_6}{\partial T^{*2}}$	T^*	I_6	$T^*\frac{\partial I_6}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_6}{\partial T^{*2}}$
.300	1.512780−01	−2.234974+00	3.576831+01	1.500	1.179760−10	−1.411552−09	1.839032−08
.305	1.185551−01	−1.744923+00	2.782351+01	1.550	7.972355−11	−9.519077−10	1.237681−08
.310	9.336261−02	−1.369098+00	2.175326+01	1.600	5.459006−11	−6.505462−10	8.442348−09
.315	7.386774−02	−1.079359+00	1.709040+01	1.650	3.784450−11	−4.501637−10	5.831401−09
.320	5.870707−02	−8.548571−01	1.349016+01	1.700	2.654101−11	−3.151602−10	4.075616−09
.325	4.686070−02	−6.800556−01	1.069657+01	1.750	1.881706−11	−2.230752−10	2.880126−09
.330	3.756146−02	−5.433122−01	8.518508+00	1.800	1.347804−11	−1.595321−10	2.056564−09
.335	3.022925−02	−4.358561−01	6.812511+00	1.850	9.747357−12	−1.152031−10	1.482944−09
.340	2.442321−02	−3.510454−01	5.470309+00	1.900	7.113753−12	−8.395811−11	1.079247−09
.350	1.612120−02	−2.303300−01	3.568340+00	2.000	3.886294−12	−4.574646−11	5.865341−10
.345	1.980667−02	−2.838253−01	4.409785+00	2.100	2.189841−12	−2.571534−11	3.289303−10
.360	1.079196−02	−1.533103−01	2.361990+00	2.200	1.268896−12	−1.486794−11	1.897683−10
.370	7.320163−03	−1.034259−01	1.585042+00	2.300	7.541424−13	−8.818598−12	1.123332−10
.380	5.026975−03	−7.065815−02	1.077419+00	2.400	4.586905−13	−5.353707−12	6.807154−11
.390	3.492499−03	−4.884739−02	7.412649−01	2.500	2.849539−13	−3.320150−12	4.214339−11
.400	2.453100−03	−3.414798−02	5.158206−01	2.600	1.804972−13	−2.099689−12	2.660968−11
.410	1.740901−03	−2.412444−02	3.628094−01	2.700	1.163985−13	−1.352013−12	1.710903−11
.420	1.247570−03	−1.721333−02	2.577828−01	2.800	7.631675−14	−8.852079−13	1.118642−11
.430	9.023176−04	−1.239807−02	1.849211−01	2.900	5.081196−14	−5.886020−13	7.428605−12
.440	6.583363−04	−9.009698−03	1.338617−01	3.000	3.431772−14	−3.970447−13	5.004939−12
.450	4.843231−04	−6.602888−03	9.773732−02	3.100	2.348860−14	−2.714407−13	3.417743−12
.460	3.591217−04	−4.877993−03	7.194662−02	3.200	1.627808−14	−1.879087−13	2.363441−12
.470	2.682873−04	−3.631291−03	5.337426−02	3.300	1.141337−14	−1.316163−13	1.653739−12
.480	2.018622−04	−2.722920−03	3.988987−02	3.400	8.090548−15	−9.320739−14	1.170013−12
.490	1.529192−04	−2.055960−03	3.002284−02	3.500	5.794445−15	−6.669341−14	8.364275−13
.500	1.165966−04	−1.562653−03	2.274880−02	3.600	4.190410−15	−4.818888−14	6.038338−13
.510	8.945426−05	−1.195226−03	1.734809−02	3.700	3.058265−15	−3.514014−14	4.399647−13
.520	6.903821−05	−9.197218−04	1.331093−02	3.800	2.251385−15	−2.584840−14	3.233770−13
.530	5.358472−05	−7.118185−04	1.027338−02	3.900	1.671015−15	−1.917062−14	2.396560−13
.540	4.181691−05	−5.539657−04	7.973684−03	4.000	1.249919−15	−1.432929−14	1.790065−13
.550	3.280388−05	−4.334089−04	6.222201−03	4.250	6.241599−16	−7.143567−15	8.909370−14
.560	2.586245−05	−3.408169−04	4.880602−03	4.500	3.246397−16	−3.709980−15	4.620236−14
.580	1.630543−05	−2.138188−04	3.047276−03	4.750	1.750823−16	−1.998140−15	2.485084−14
.600	1.046427−05	−1.365882−04	1.937839−03	5.000	9.753675−17	−1.111781−15	1.381053−14
.620	6.827114−06	−8.872563−05	1.253446−03	5.250	5.594691−17	−6.370031−16	7.904130−15
.640	4.522859−06	−5.853823−05	8.236679−04	5.500	3.295050−17	−3.747851−16	4.645758−15
.660	3.039371−06	−3.918524−05	5.492705−04	5.750	1.987859−17	−2.258898−16	2.797483−15
.680	2.069858−06	−2.658774−05	3.713502−04	6.000	1.225863−17	−1.391794−16	1.722160−15
.700	1.427294−06	−1.827003−05	2.543082−04	6.250	7.713271−18	−8.750266−17	1.081870−15
.720	9.957880−07	−1.270439−05	1.762658−04	6.500	4.943993−18	−5.604477−17	6.924178−16
.740	7.024169−07	−8.933328−06	1.235633−04	6.750	3.223609−18	−3.651711−17	4.508487−16
.760	5.006317−07	−6.347952−06	8.754577−05	7.000	2.135420−18	−2.417430−17	2.982698−16
.780	3.603144−07	−4.555693−06	6.265280−05	7.250	1.435523−18	−1.624110−17	2.002670−16
.800	2.617279−07	−3.300174−06	4.526498−05	7.500	9.783254−19	−1.106215−17	1.363290−16
.820	1.917820−07	−2.411910−06	3.299722−05	7.750	6.753160−19	−7.631835−18	9.400408−17
.840	1.416955−07	−1.777562−06	2.425938−05	8.000	4.717627−19	−5.328743−18	6.560318−17
.860	1.055142−07	−1.320508−06	1.797956−05	8.250	3.332797−19	−3.762716−18	4.630162−17
.880	7.915934−08	−9.884089−07	1.342765−05	8.500	2.379403−19	−2.685118−18	3.302659−17
.900	5.980976−08	−7.451628−07	1.010134−05	9.000	1.248695−19	−1.407951−18	1.730330−17
.920	4.549608−08	−5.656340−07	7.651815−06	9.500	6.788893−20	−7.648939−19	9.393308−18
.940	3.483144−08	−4.321663−07	5.834665−06	10.000	3.809791−20	−4.289482−19	5.264146−18
.960	2.683103−08	−3.322525−07	4.477153−06	10.500	2.199906−20	−2.475343−19	3.035917−18
.980	2.078991−08	−2.569606−07	3.456208−06	11.000	1.303589−20	−1.465960−19	1.796928−18
1.000	1.619969−08	−1.998634−07	2.683460−06	11.500	7.908621−21	−8.888996−20	1.089018−18
1.025	1.194938−08	−1.471050−07	1.970895−06	12.000	4.902360−21	−5.507381−20	6.744014−19
1.050	8.884709−09	−1.091495−07	1.459392−06	12.500	3.099438−21	−3.480378−20	4.259967−19
1.075	6.656181−09	−8.160901−08	1.089031−06	13.000	1.995515−21	−2.239835−20	2.740412−19
1.100	5.022610−09	−6.146292−08	8.186574−07	13.500	1.306530−21	−1.465920−20	1.792845−19
1.150	2.918192−09	−3.558260−08	4.722774−07	14.000	8.688430−22	−9.744807−21	1.191376−19
1.200	1.738258−09	−2.112502−08	2.794753−07	15.000	4.008585−22	−4.492980−21	5.489411−20
1.250	1.059228−09	−1.283327−08	1.692674−07	16.000	1.945034−22	−2.178790−21	2.660450−20
1.300	6.590456−10	−7.961991−09	1.047225−07	17.000	9.864462−23	−1.104419−21	1.347874−20
1.350	4.179904−10	−5.036343−09	6.606902−08	18.000	5.202547−23	−5.822000−22	7.102089−21
1.400	2.698360−10	−3.243154−09	4.244129−08	19.000	2.841207−23	−3.178152−22	3.875312−21
1.450	1.770703−10	−2.123245−09	2.772213−08	20.000	1.600919−23	−1.790084−22	2.181928−21

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m=60$

T^*	B_0^*	$T^*\frac{\partial B_0^*}{\partial T^*}$	$T^{*2}\frac{\partial^2 B_0^*}{\partial T^{*2}}$	T^*	B_0^*	$T^*\frac{\partial B_0^*}{\partial T^*}$	$T^{*2}\frac{\partial^2 B_0^*}{\partial T^{*2}}$
.300	−11.92776	32.43477	−146.70903	1.500	−.07956	1.19400	−2.80363
.305	−11.40595	30.61402	−136.79848	1.550	−.04126	1.14261	−2.66938
.310	−10.92284	28.94770	−127.82393	1.600	−.00574	1.09524	−2.54959
.315	−10.47201	27.41918	−119.67757	1.650	.02729	1.05157	−2.44984
.320	−10.05137	26.01407	−112.26570	1.700	.05807	1.01105	−2.33634
.325	−9.65817	24.71966	−105.50644	1.750	.08683	.97338	−2.24890
.330	−9.28998	23.52477	−99.32835	1.800	.11375	.93847	−2.15495
.335	−8.94462	22.41953	−93.66903	1.850	.13902	.90580	−2.07406
.340	−8.62014	21.39526	−88.47393	1.900	.16276	.87525	−1.99888
.345	−8.31481	20.44428	−83.69531	2.000	.20621	.81970	−1.86324
.350	−8.02707	19.55980	−79.29125	2.100	.24499	.77051	−1.74433
.360	−7.49890	17.96684	−71.46363	2.200	.27980	.72665	−1.63926
.370	−7.02602	16.57559	−64.74451	2.300	.31122	.68730	−1.54578
.380	−6.60055	15.35336	−58.93947	2.400	.33971	.65180	−1.46208
.390	−6.21599	14.27372	−53.89356	2.500	.36566	.61961	−1.38673
.400	−5.86692	13.31512	−49.48237	2.600	.38939	.59029	−1.31852
.410	−5.54886	12.46001	−45.60628	2.700	.41116	.56347	−1.25651
.420	−5.25795	11.69383	−42.18303	2.800	.43120	.53886	−1.19991
.430	−4.99100	11.00447	−39.14608	2.900	.44970	.51618	−1.14805
.440	−4.74527	10.38184	−36.44013	3.000	.46684	.49522	−1.10034
.450	−4.51838	9.81741	−34.01921	3.100	.48275	.47579	−1.05631
.460	−4.30832	9.30400	−31.84498	3.200	.49757	.45772	−1.01555
.470	−4.11332	8.83548	−29.88525	3.300	.51139	.44088	−.97771
.480	−3.93187	8.40665	−28.11286	3.400	.52432	.42514	−.94248
.490	−3.76263	8.01300	−26.50471	3.500	.53643	.41041	−.90961
.500	−3.60444	7.65069	−25.04114	3.600	.54780	.39659	−.87887
.510	−3.45628	7.31636	−23.70530	3.700	.55848	.38359	−.85006
.520	−3.31724	7.00709	−22.48269	3.800	.56855	.37135	−.82302
.530	−3.18652	6.72035	−21.36081	3.900	.57804	.35980	−.79757
.540	−3.06342	6.45392	−20.32883	4.000	.58701	.34889	−.77359
.550	−2.94729	6.20585	−19.37730	4.250	.60745	.32410	−.71915
.560	−2.83757	5.97442	−18.49797	4.500	.62529	.30220	−.67172
.580	−2.63539	5.55556	−16.92798	4.750	.64109	.28283	−.62983
.600	−2.45339	5.18709	−15.57093	5.000	.65516	.26556	−.59259
.620	−2.28873	4.86089	−14.38937	5.250	.66774	.25005	−.55929
.640	−2.13908	4.57040	−13.35373	5.500	.67904	.23603	−.52935
.660	−2.00249	4.31034	−12.44041	5.750	.68924	.22331	−.50227
.680	−1.87735	4.07636	−11.63041	6.000	.69850	.21172	−.47765
.700	−1.76229	3.86490	−10.90829	6.250	.70693	.20111	−.45518
.720	−1.65614	3.67298	−10.26141	6.500	.71462	.19136	−.43458
.740	−1.55793	3.49812	−9.67932	6.750	.72167	.18237	−.41564
.760	−1.46680	3.33822	−9.15336	7.000	.72815	.17405	−.39816
.780	−1.38201	3.19152	−8.67626	7.250	.73412	.16634	−.38198
.800	−1.30293	3.05649	−8.24191	7.500	.73964	.15916	−.36695
.820	−1.22901	2.93184	−7.84514	7.750	.74475	.15247	−.35296
.840	−1.15976	2.81647	−7.48155	8.000	.74949	.14621	−.33991
.860	−1.09476	2.70940	−7.14737	8.250	.75390	.14035	−.32770
.880	−1.03363	2.60979	−6.83936	8.500	.75801	.13484	−.31625
.900	−.97603	2.51692	−6.55471	9.000	.76542	.12478	−.29537
.920	−.92167	2.43013	−6.29100	9.500	.77193	.11582	−.27681
.940	−.87029	2.34888	−6.04612	10.000	.77766	.10779	−.26021
.960	−.82164	2.27265	−5.81821	10.500	.78274	.10054	−.24526
.980	−.77553	2.20101	−5.60565	11.000	.78726	.09397	−.23173
1.000	−.73175	2.13356	−5.40702	11.500	.79130	.08799	−.21943
1.025	−.68005	2.05462	−5.17641	12.000	.79493	.08252	−.20820
1.050	−.63143	1.98109	−4.96342	12.500	.79820	.07750	−.19790
1.075	−.58562	1.91244	−4.76618	13.000	.80115	.07287	−.18842
1.100	−.54240	1.84822	−4.58307	13.500	.80382	.06859	−.17967
1.150	−.46291	1.73107	−4.20864	14.000	.80624	.06463	−.17157
1.200	−.39141	1.62808	−3.96646	15.000	.81045	.05751	−.15703
1.250	−.32683	1.53559	−3.72083	16.000	.81396	.05130	−.14437
1.300	−.26825	1.45335	−3.48963	17.000	.81690	.04583	−.13323
1.350	−.21483	1.37880	−3.27199	18.000	.81938	.04098	−.12336
1.400	−.16591	1.31145	−3.11097	19.000	.82148	.03664	−.11455
1.450	−.12097	1.24997	−2.96763	20.000	.82326	.03275	−.10665

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TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
.300	2.18713	27.39035	−124.3045	780.3366	2.195606+01	−1.500621+02	1.246400+03
.305	2.16912	25.42243	−113.9775	708.6089	1.961920+01	−1.330553+02	1.097486+03
.310	2.15156	23.64525	−104.7573	645.1458	1.757799+01	−1.183158+02	9.693196+02
.315	2.13442	22.03617	−96.50201	588.8258	1.578952+01	−1.054994+02	8.586297+02
.320	2.11767	20.57566	−89.09070	538.7003	1.421785+01	−9.432008+01	7.627169+02
.325	2.10132	19.24686	−82.41980	493.9643	1.283279+01	−8.453940+01	6.793447+02
.330	2.08534	18.03513	−76.40035	453.9321	1.160884+01	−7.595751+01	6.066523+02
.335	2.06972	16.92774	−70.95575	418.0176	1.052444+01	−6.840648+01	5.430856+02
.340	2.05445	15.91359	−66.01978	385.7179	9.561232+00	−6.174466+01	4.873421+02
.345	2.03950	14.98295	−61.53506	356.6007	8.703612+00	−5.585218+01	4.383264+02
.350	2.02488	14.12730	−57.45166	330.2927	7.938215+00	−5.062722+01	3.951135+02
.360	1.99656	12.61182	−50.32023	284.8545	6.639875+00	−4.184561+01	3.230819+02
.370	1.96940	11.31702	−44.33850	247.2937	5.592356+00	−3.484575+01	2.662837+02
.380	1.94331	10.20353	−39.28490	216.0042	4.740455+00	−2.921870+01	2.210962+02
.390	1.91824	9.240141	−34.98674	189.7508	4.042482+00	−2.465932+01	1.848455+02
.400	1.89411	8.401908	−31.30818	167.5747	3.466641+00	−2.093764+01	1.555366+02
.410	1.87086	7.668721	−28.14147	148.7245	2.988460+00	−1.787861+01	1.316666+02
.420	1.84846	7.024254	−25.40043	132.6069	2.588946+00	−1.534784+01	1.120925+02
.430	1.82684	6.455156	−23.01565	118.7493	2.253236+00	−1.324126+01	9.593735+01
.440	1.80596	5.950438	−20.93081	106.7729	1.969612+00	−1.147763+01	8.252270+01
.450	1.78578	5.500996	−19.09990	96.37138	1.728766+00	−9.993088+00	7.131966+01
.460	1.76626	5.099247	−17.48510	87.29599	1.523261+00	−8.737026+00	6.191285+01
.470	1.74737	4.738837	−16.05517	79.34305	1.347108+00	−7.669110+00	5.397371+01
.480	1.72907	4.414412	−14.78411	72.34496	1.195464+00	−6.756969+00	4.724067+01
.490	1.71134	4.121444	−13.65019	66.16304	1.064383+00	−5.974475+00	4.150417+01
.500	1.69414	3.856078	−12.63516	60.68186	9.506355−01	−5.300415+00	3.659532+01
.510	1.67745	3.615024	−11.72360	55.80493	8.515640−01	−4.717471+00	3.237722+01
.520	1.66124	3.395457	−10.90247	51.45116	7.649713−01	−4.211435+00	2.873834+01
.530	1.64549	3.194946	−10.16062	47.55208	6.890317−01	−3.770587+00	2.558727+01
.540	1.63019	3.011386	−9.488539	44.04967	6.222217−01	−3.385222+00	2.284883+01
.550	1.61530	2.842952	−8.878054	40.89452	5.632639−01	−3.047259+00	2.046079+01
.560	1.60081	2.688053	−8.322125	38.04441	5.110838−01	−2.749946+00	1.837151+01
.580	1.57297	2.413475	−7.350362	33.11939	4.235629−01	−2.255495+00	1.492375+01
.600	1.54653	2.178445	−6.533459	29.04052	3.539145−01	−1.866333+00	1.223737+01
.620	1.52138	1.975809	−5.841070	25.63200	2.979529−01	−1.556882+00	1.012149+01
.640	1.49742	1.799941	−5.249775	22.76010	2.525876−01	−1.308479+00	8.438248+00
.660	1.47456	1.646372	−4.741299	20.32190	2.155091−01	−1.107330+00	7.086804+00
.680	1.45271	1.511521	−4.301236	18.23738	1.849721−01	−9.431214−01	5.992450+00
.700	1.43181	1.392490	−3.918120	16.44362	1.596440−01	−8.080564−01	5.099225+00
.720	1.41178	1.286918	−3.582747	14.89076	1.384973−01	−6.961812−01	4.364761+00
.740	1.39257	1.192863	−3.287665	13.53891	1.207327−01	−6.029058−01	3.756663+00
.760	1.37413	1.108720	−3.026797	12.35588	1.057230−01	−5.246604−01	3.249935+00
.780	1.35640	1.033151	−2.795153	11.31555	9.297221−02	−4.586454−01	2.825120+00
.800	1.33934	.9650366	−2.588603	10.39653	8.208531−02	−4.026481−01	2.466953+00
.820	1.32290	.9034320	−2.403713	9.581195	7.274530−02	−3.549070−01	2.163363+00
.840	1.30706	.8475369	−2.237606	8.854943	6.469620−02	−3.140099−01	1.904738+00
.860	1.29177	.7966697	−2.087861	8.205598	5.773003−02	−2.788174−01	1.683371+00
.880	1.27701	.7502472	−1.952432	7.622952	5.167678−02	−2.484044−01	1.493045+00
.900	1.26274	.7077679	−1.829575	7.098400	4.639675−02	−2.220156−01	1.328712+00
.920	1.24894	.6687987	−1.717803	6.624653	4.177449−02	−1.990308−01	1.186251+00
.940	1.23558	.6329643	−1.615840	6.195509	3.771416−02	−1.789381−01	1.062280+00
.960	1.22264	.5999380	−1.522583	5.805667	3.413578−02	−1.613130−01	9.540085−01
.980	1.21010	.5694344	−1.437083	5.450573	3.097235−02	−1.458016−01	8.591217−01
1.000	1.19794	.5412035	−1.358511	5.126306	2.816747−02	−1.321076−01	7.756921−01
1.025	1.18324	.5087782	−1.268950	4.759193	2.509364−02	−1.171704−01	6.850848−01
1.050	1.16907	.4791884	−1.187884	4.429308	2.242853−02	−1.042838−01	6.072811−01
1.075	1.15539	.4521132	−1.114280	4.131873	2.010861−02	−9.311965−02	5.401786−01
1.100	1.14219	.4272757	−1.047259	3.862845	1.808158−02	−8.340946−02	4.820655−01
1.150	1.11708	.3833857	−.9300484	3.396728	1.474033−02	−6.750484−02	3.874469−01
1.200	1.09356	.3459468	−.8313636	3.008910	1.213792−02	−5.521697−02	3.149004−01
1.250	1.07147	.3137538	−.7475211	2.683014	1.008657−02	−4.560314−02	2.585407−01
1.300	1.05066	.2858701	−.6757037	2.406686	8.451882−03	−3.799493−02	2.142299−01
1.350	1.03102	.2615590	−.6137287	2.170472	7.136206−03	−3.191074−02	1.790107−01
1.400	1.01244	.2402347	−.5598845	1.967049	6.067583−03	−2.699857−02	1.507372−01
1.450	.99483	.2214268	−.5128145	1.790677	5.192305−03	−2.299763−02	1.278308−01

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m = 60$

T^*	Y	I_1	$T^* \frac{\partial I_1}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_1}{\partial T^{*2}}$	I_2	$T^* \frac{\partial I_2}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_2}{\partial T^{*2}}$
1.50	.97811	.2047538	−.4714322	1.636807	4.469815−03	−1.971237−02	1.091155−01
1.55	.96221	.1899040	−.4348599	1.501800	3.869146−03	−1.699446−02	9.370459−02
1.60	.94705	.1766206	−.4023822	1.382720	3.366421−03	−1.473022−02	8.092259−02
1.65	.93259	.1646904	−.3734114	1.277174	2.943050−03	−1.283169−02	7.024950−02
1.70	.91878	.1539354	−.3474614	1.183201	2.584438−03	−1.123015−02	6.128138−02
1.75	.90556	.1442058	−.3241271	1.099180	2.279031−03	−9.871520−03	5.370164−02
1.80	.89289	.1353751	−.3030691	1.023762	2.017612−03	−8.712842−03	4.726016−02
1.85	.88074	.1273356	−.2840010	.9558179	1.792775−03	−7.719781−03	4.175781−02
1.90	.86908	.1199953	−.2666802	.8943969	1.598533−03	−6.864689−03	3.703493−02
2.00	.84707	.1071076	−.2364822	.7880244	1.283220−03	−5.482914−03	2.943622−02
2.10	.82666	.09620016	−.2111474	.6995223	1.042251−03	−4.432974−03	2.369405−02
2.20	.80765	.08688633	−.1896853	.6251142	8.555049−04	−3.623533−03	1.928937−02
2.30	.78990	.07886948	−.1713452	.5619675	7.089437−04	−2.991305−03	1.586481−02
2.40	.77327	.07191900	−.1555495	.5079247	5.925992−04	−2.491627−03	1.316966−02
2.50	.75764	.06585339	−.1418483	.4613202	4.992760−04	−2.092443−03	1.102494−02
2.60	.74293	.06052822	−.1298868	.4208513	4.237039−04	−1.770399−03	9.300924−03
2.70	.72904	.05582742	−.1193823	.3854882	3.619703−04	−1.508241−03	7.902201−03
2.80	.71590	.05165683	−.1101072	.3544077	3.111343−04	−1.293059−03	6.757700−03
2.90	.70345	.04793940	−.1018768	.3269459	2.689605−04	−1.115081−03	5.813840−03
3.00	.69163	.04461163	−.09453957	.3025626	2.337314−04	−9.668301−04	5.029774−03
3.10	.68038	.04162075	−.08797075	.2808144	2.041147−04	−8.425275−04	4.374046−03
3.20	.66967	.03892266	−.08206651	.2613350	1.790677−04	−7.376654−04	3.822202−03
3.30	.65944	.03648025	−.07674000	.2438196	1.577672−04	−6.486970−04	3.355060−03
3.40	.64967	.03426212	−.07191812	.2280128	1.395583−04	−5.728095−04	2.957453−03
3.50	.64032	.03224156	−.06753898	.2136993	1.239161−04	−5.077549−04	2.617292−03
3.60	.63137	.03039571	−.06354991	.2006967	1.104170−04	−4.517242−04	2.324875−03
3.70	.62278	.02870494	−.05990582	.1888496	9.871707−05	−4.032518−04	2.072363−03
3.80	.61453	.02715231	−.05656800	.1780250	8.853502−05	−3.611429−04	1.853377−03
3.90	.60660	.02572312	−.05350299	.1681085	7.963979−05	−3.244177−04	1.662702−03
4.00	.59897	.02440459	−.05068180	.1590011	7.184040−05	−2.922686−04	1.496046−03
4.25	.58109	.02152244	−.04453758	.1392368	5.615845−05	−2.277914−04	1.162626−03
4.50	.56471	.01912514	−.03945178	.1229541	4.455124−05	−1.802308−04	9.175014−04
4.75	.54965	.01710946	−.03519410	.1093801	3.580814−05	−1.445157−04	7.339753−04
5.00	.53573	.01539829	−.03159370	.09794501	2.911894−05	−1.172661−04	5.943262−04
5.25	.52282	.01393310	−.02852166	.08822132	2.392916−05	−9.617762−05	4.865146−04
5.50	.51080	.01266876	−.02587922	.07988333	1.985170−05	−7.964680−05	4.021909−04
5.75	.49957	.01157008	−.02358968	.07267932	1.661145−05	−6.653760−05	3.354566−04
6.00	.48906	.01060925	−.02159274	.06641226	1.400967−05	−5.603164−05	2.820743−04
6.25	.47918	.009764073	−.01984048	.06092617	1.190066−05	−4.753057−05	2.389534−04
6.50	.46987	.009016656	−.01829439	.05609624	1.017619−05	−4.059081−05	2.038081−04
6.75	.46109	.008352437	−.01692329	.05182164	8.754800−06	−3.487944−05	1.749265−04
7.00	.45278	.007759475	−.01570165	.04802022	7.574544−06	−3.014367−05	1.510113−04
7.25	.44490	.007227901	−.01460846	.04462450	6.587781−06	−2.618950−05	1.310687−04
7.50	.43743	.006749498	−.01362628	.04157860	5.757527−06	−2.286658−05	1.143299−04
7.75	.43031	.006317382	−.01274053	.03883596	5.054808−06	−2.005734−05	1.001945−04
8.00	.42354	.005925753	−.01193896	.03635754	4.456734−06	−1.766902−05	8.818987−05
8.25	.41707	.005569688	−.01121119	.03411038	3.945081−06	−1.562790−05	7.794054−05
8.50	.41089	.005244996	−.01054842	.03206650	3.505230−06	−1.387490−05	6.914627−05
9.00	.39931	.004675863	−.009388765	.02849656	2.795927−06	−1.105171−05	5.500120−05
9.50	.38866	.004195152	−.008411446	.02549441	2.258234−06	−8.915069−06	4.431301−05
10.00	.37882	.003785401	−.007580036	.02294537	1.844343−06	−7.272817−06	3.610981−05
10.50	.36969	.003433259	−.006866838	.02076266	1.521824−06	−5.994797−06	2.973417−05
11.00	.36119	.003128382	−.006250361	.01887894	1.267117−06	−4.986730−06	2.471127−05
11.50	.35325	.002862648	−.005713838	.01724190	1.063836−06	−4.183088−06	2.071131−05
12.00	.34581	.002629613	−.005243980	.01581019	8.999652−07	−3.535911−06	1.749334−05
12.50	.33883	.002424107	−.004830151	.01455075	7.666484−07	−3.009898−06	1.488024−05
13.00	.33225	.002241946	−.004463759	.01343694	6.572726−07	−2.578722−06	1.274009−05
13.50	.32604	.002079712	−.004137800	.01244708	5.668399−07	−2.222511−06	1.097343−05
14.00	.32016	.001934592	−.003846519	.01156339	4.915315−07	−1.926097−06	9.504413−06
15.00	.30931	.001686747	−.003349722	.01005819	3.751475−07	−1.468468−06	7.238648−06
16.00	.29948	.001483943	−.002943875	.008830509	2.914333−07	−1.139707−06	5.612884−06
17.00	.29054	.001315860	−.002608000	.007815922	2.299419−07	−8.984820−07	4.421274−06
18.00	.28236	.001174981	−.002326846	.006967694	1.839324−07	−7.181670−07	3.531395−06
19.00	.27483	.001055718	−.002089107	.006251251	1.489385−07	−5.811426−07	2.855738−06
20.00	.26787	.000953852	−.001886259	.005640568	1.219307−07	−4.754727−07	2.335088−06

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$	T^*	I_3	$T^*\frac{\partial I_3}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_3}{\partial T^{*2}}$
.300	1.112181+01	−9.913713+01	1.018720+03	1.500	8.498052−05	−5.435737−04	4.072776−03
.305	9.602355+00	−8.508517+01	8.694753+02	1.550	6.892443−05	−4.395042−04	3.283083−03
.310	8.317346+00	−7.327347+01	7.447318+02	1.600	5.630924−05	−3.580143−04	2.666757−03
.315	7.226695+00	−6.330753+01	6.400597+02	1.650	4.631578−05	−2.936659−04	2.181582−03
.320	6.297802+00	−5.486853+01	5.518997+02	1.700	3.833819−05	−2.424527−04	1.796572−03
.325	5.504047+00	−4.769773+01	4.773795+02	1.750	3.192387−05	−2.013924−04	1.488743−03
.330	4.823601+00	−4.158419+01	4.141700+02	1.800	2.673157−05	−1.682443−04	1.240882−03
.335	4.238494+00	−3.635528+01	3.603757+02	1.850	2.250171−05	−1.413097−04	1.039983−03
.340	3.733876+00	−3.186915+01	3.144467+02	1.900	1.903525−05	−1.192899−04	8.761299−04
.345	3.297433+00	−2.800881+01	2.751118+02	2.000	1.381118−05	−8.621505−05	6.308059−04
.350	2.918914+00	−2.467742+01	2.413235+02	2.100	1.019047−05	−6.338806−05	4.621863−04
.360	2.302798+00	−1.929305+01	1.870713+02	2.200	7.633564−06	−4.732979−05	3.440098−04
.370	1.832288+00	−1.521914+01	1.463770+02	2.300	5.797086−06	−3.583668−05	2.597190−04
.380	1.469569+00	−1.210625+01	1.155388+02	2.400	4.457643−06	−2.748124−05	1.986333−04
.390	1.187471+00	−9.705698+00	9.194505+01	2.500	3.466942−06	−2.131971−05	1.537180−04
.400	9.662543−01	−7.838426+00	7.373142+01	2.600	2.724736−06	−1.671642−05	1.202521−04
.410	7.914269−01	−6.374150+00	5.955222+01	2.700	2.162111−06	−1.323588−05	9.501196−05
.420	6.522485−01	−5.217111+00	4.842607+01	2.800	1.730964−06	−1.057506−05	7.576127−05
.430	5.406845−01	−4.296251+00	3.963024+01	2.900	1.397238−06	−8.520072−06	6.092601−05
.440	4.506732−01	−3.558378+00	3.262755+01	3.000	1.136504−06	−6.917897−06	4.938326−05
.450	3.776035−01	−2.963330+00	2.701524+01	3.100	9.310260−07	−5.657735−06	4.032188−05
.460	3.179410−01	−2.480543+00	2.248886+01	3.200	7.677819−07	−4.658428−06	3.314912−05
.470	2.689565−01	−2.086581+00	1.881646+01	3.300	6.371087−07	−3.859891−06	2.742714−05
.480	2.285282−01	−1.763345+00	1.582001+01	3.400	5.317662−07	−3.217200−06	2.282925−05
.490	1.949952−01	−1.496760+00	1.336192+01	3.500	4.462790−07	−2.696452−06	1.910936−05
.500	1.670499−01	−1.275812+00	1.133514+01	3.600	3.764706−07	−2.271833−06	1.608050−05
.510	1.436560−01	−1.091828+00	9.655833+00	3.700	3.191296−07	−1.923532−06	1.359940−05
.520	1.239880−01	−9.379356−01	8.257957+00	3.800	2.717675−07	−1.636223−06	1.155540−05
.530	1.073847−01	−8.086638−01	7.089189+00	3.900	2.324420−07	−1.397965−06	9.862432−06
.540	9.331343−02	−6.996299−01	6.107839+00	4.000	1.996270−07	−1.199387−06	8.453071−06
.550	8.134345−02	−6.073067−01	5.280520+00	4.250	1.387452−07	−8.316519−07	5.847890−06
.560	7.112443−02	−5.288411−01	4.580354+00	4.500	9.853262−08	−5.893793−07	4.135812−06
.580	5.484617−02	−4.046339−01	3.478595+00	4.750	7.132790−08	−4.258503−07	2.982776−06
.600	4.274869−02	−3.130797−01	2.672749+00	5.000	5.252624−08	−3.130650−07	2.189134−06
.620	3.365039−02	−2.447522−01	2.075718+00	5.250	3.928104−08	−2.337594−07	1.632101−06
.640	2.673188−02	−1.931711−01	1.628112+00	5.500	2.978786−08	−1.770156−07	1.234204−06
.660	2.141683−02	−1.538161−01	1.288820+00	5.750	2.287665−08	−1.357694−07	9.454191−07
.680	1.729464−02	−1.234913−01	1.028992+00	6.000	1.777305−08	−1.053546−07	7.327690−07
.700	1.406913−02	−9.990879−02	8.281132−01	6.250	1.395495−08	−8.263064−08	5.740961−07
.720	1.152429−02	−8.141133−02	6.714250−01	6.500	1.106423−08	−6.544718−08	4.542540−07
.740	9.500862−03	−6.678537−02	5.481861−01	6.750	8.851462−09	−5.230853−08	3.627233−07
.760	7.880281−03	−5.513316−02	4.504982−01	7.000	7.140338−09	−4.215920−08	2.920908−07
.780	6.573451−03	−4.578413−02	3.724957−01	7.250	5.804620−09	−3.424432−08	2.370618−07
.800	5.512832−03	−3.823291−02	3.097818−01	7.500	4.752780−09	−2.801732−08	1.938070−07
.820	4.646803−03	−3.209537−02	2.590319−01	7.750	3.917707−09	−2.307786−08	1.595249−07
.840	3.935602−03	−2.707719−02	2.177117−01	8.000	3.249659−09	−1.912956−08	1.321437−07
.860	3.348376−03	−2.295116−02	1.838739−01	8.250	2.711405−09	−1.595079−08	1.101157−07
.880	2.861019−03	−1.954061−02	1.560115−01	8.500	2.274817−09	−1.337429−08	9.227383−08
.900	2.454574−03	−1.670725−02	1.329498−01	9.000	1.625863−09	−9.548229−09	6.580416−08
.920	2.114035−03	−1.434211−02	1.137674−01	9.500	1.183739−09	−6.944777−09	4.781449−08
.940	1.827459−03	−1.235883−02	9.773696−02	10.000	8.762428−10	−5.136080−09	3.533007−08
.960	1.585281−03	−1.068854−02	8.428062−02	10.500	6.583784−10	−3.855882−09	2.650229−08
.980	1.379805−03	−9.276048−03	7.293702−02	11.000	5.014143−10	−2.934384−09	2.015367−08
1.000	1.204803−03	−8.076847−03	6.333565−02	11.500	3.865967−10	−2.260881−09	1.551740−08
1.025	1.021282−03	−6.823547−03	5.333391−02	12.000	3.014385−10	−1.761739−09	1.208399−08
1.050	8.696312−04	−5.791668−03	4.512804−02	12.500	2.374733−10	−1.387081−09	9.508658−09
1.075	7.436716−04	−4.937589−03	3.835887−02	13.000	1.888645−10	−1.102556−09	7.554135−09
1.100	6.385413−04	−4.227125−03	3.274604−02	13.500	1.515272−10	−8.841389−10	6.054637−09
1.150	4.761501−04	−3.134742−03	2.415417−02	14.000	1.225618−10	−7.147924−10	4.892666−09
1.200	3.600552−04	−2.358401−03	1.808281−02	15.000	8.197517−11	−4.776785−10	3.266901−09
1.250	2.757515−04	−1.797729−03	1.372117−02	16.000	5.628827−11	−3.277512−10	2.239870−09
1.300	2.136556−04	−1.386842−03	1.054036−02	17.000	3.955154−11	−2.301439−10	1.571782−09
1.350	1.673171−04	−1.081664−03	8.188613−03	18.000	2.836368−11	−1.649450−10	1.125840−09
1.400	1.323208−04	−8.521942−04	6.427779−03	19.000	2.071327−11	−1.203903−10	8.212952−10
1.450	1.055969−04	−6.776843−04	5.093987−03	20.000	1.537463−11	−8.931750−11	6.090267−10

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	I_4	$T^*\frac{\partial I_4}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_4}{\partial T^{*2}}$	T^*	I_4	$T^*\frac{\partial I_4}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_4}{\partial T^{*2}}$
.300	3.827353+00	−4.184820+01	5.118746+02	1.500	1.195101−06	−9.976400−06	9.403693−05
.305	3.195951+00	−3.477395+01	4.233654+02	1.550	9.092431−07	−7.570972−06	7.118704−05
.310	2.678832+00	−2.900910+01	3.515816+02	1.600	6.982428−07	−5.800233−06	5.441050−05
.315	2.253566+00	−2.429131+01	2.931074+02	1.650	5.409016−07	−4.483155−06	4.196302−05
.320	1.902452+00	−2.041459+01	2.452743+02	1.700	4.224496−07	−3.493985−06	3.263643−05
.325	1.611455+00	−1.721646+01	2.059871+02	1.750	3.324740−07	−2.744317−06	2.558367−05
.330	1.369397+00	−1.456814+01	1.735931+02	1.800	2.635529−07	−2.171303−06	2.020416−05
.335	1.167336+00	−1.236711+01	1.467824+02	1.850	2.103408−07	−1.729794−06	1.606748−05
.340	9.980881−01	−1.053137+01	1.245123+02	1.900	1.689502−07	−1.387033−06	1.286208−05
.345	8.558589−01	−8.995109+00	1.059491+02	2.000	1.109605−07	−9.080636−07	8.394332−06
.350	7.359559−01	−7.705260+00	9.042370+01	2.100	7.447567−08	−6.077248−07	5.602013−06
.360	5.485736−01	−5.701059+00	6.643153+01	2.200	5.097684−08	−4.148761−07	3.814423−06
.370	4.130555−01	−4.262532+00	4.933501+01	2.300	3.551804−08	−2.883646−07	2.644956−06
.380	3.139722−01	−3.218339+00	3.701033+01	2.400	2.515092−08	−2.037407−07	1.864669−06
.390	2.407841−01	−2.452350+00	2.802871+01	2.500	1.807536−08	−1.461219−07	1.334624−06
.400	1.862023−01	−1.884854+00	2.141634+01	2.600	1.316804−08	−1.062476−07	9.686049−07
.410	1.451276−01	−1.460484+00	1.650140+01	2.700	9.713852−09	−7.823801−08	7.120104−07
.420	1.139535−01	−1.140346+00	1.281504+01	2.800	7.249133−09	−5.828985−08	5.296072−07
.430	9.010287−02	−8.968329−01	1.002652+01	2.900	5.468115−09	−4.390078−08	3.982647−07
.440	7.171634−02	−7.101501−01	7.900142+00	3.000	4.165989−09	−3.339819−08	3.025540−07
.450	5.743992−02	−5.659715−01	6.266288+00	3.100	3.203557−09	−2.564757−08	2.320302−07
.460	4.627914−02	−4.538359−01	5.001794+00	3.200	2.484934−09	−1.986884−08	1.795245−07
.470	3.749751−02	−3.660397−01	4.016443+00	3.300	1.943234−09	−1.551882−08	1.400535−07
.480	3.054529−02	−2.968637−01	3.243608+00	3.400	1.531246−09	−1.221473−08	1.101114−07
.490	2.500914−02	−2.420301−01	2.633695+00	3.500	1.215279−09	−9.683825−09	8.720364−08
.500	2.057602−02	−1.983154−01	2.149519+00	3.600	9.710392−10	−7.729736−09	6.953701−08
.510	1.700729−02	−1.632743−01	1.762997+00	3.700	7.808394−10	−6.209680−09	5.580930−08
.520	1.411981−02	−1.350389−01	1.452776+00	3.800	6.316821−10	−5.018879−09	4.506618−08
.530	1.177220−02	−1.121740−01	1.202518+00	3.900	5.139340−10	−4.079769−09	3.660205−08
.540	9.854667−03	−9.356956−02	9.996445−01	4.000	4.203964−10	−3.334459−09	2.989089−08
.550	8.281469−03	−7.836267−02	8.344118−01	4.250	2.600326−10	−2.058545−09	1.841843−08
.560	6.985282−03	−6.587849−02	6.992324−01	4.500	1.654559−10	−1.307583−09	1.167957−08
.580	5.022398−03	−4.706770−02	4.965292−01	4.750	1.079587−10	−8.518711−10	7.597491−09
.600	3.658829−03	−3.408586−02	3.575203−01	5.000	7.204516−11	−5.676936−10	5.056059−09
.620	2.698044−03	−2.499507−02	2.607546−01	5.250	4.906214−11	−3.861035−10	3.434454−09
.640	2.012100−03	−1.854247−02	1.924555−01	5.500	3.402868−11	−2.674843−10	2.376595−09
.660	1.516357−03	−1.390464−02	1.436250−01	5.750	2.399813−11	−1.884378−10	1.672511−09
.680	1.153973−03	−1.053203−02	1.082934−01	6.000	1.718358−11	−1.347965−10	1.195253−09
.700	8.862462−04	−8.052604−03	8.244231−02	6.250	1.247682−11	−9.778570−11	8.663005−10
.720	6.864758−04	−6.211154−03	6.332940−02	6.500	9.176208−12	−7.185718−11	6.360684−10
.740	5.360176−04	−4.830400−03	4.905959−02	6.750	6.829097−12	−5.343568−11	4.726403−10
.760	4.217033−04	−3.785761−03	3.830748−02	7.000	5.138342−12	−4.017679−11	3.551101−10
.780	3.341323−04	−2.988723−03	3.013573−02	7.250	3.905729−12	−3.051822−11	2.695603−10
.800	2.665254−04	−2.375748−03	2.387441−02	7.500	2.997061−12	−2.340326−11	2.065858−10
.820	2.139474−04	−1.900778−03	1.903997−02	7.750	2.320220−12	−1.810717−11	1.597418−10
.840	1.727731−04	−1.530125−03	1.528008−02	8.000	1.811152−12	−1.412642−11	1.245545−10
.860	1.403168−04	−1.238930−03	1.233577−02	8.250	1.424780−12	−1.110696−11	9.788040−11
.880	1.145729−04	−1.008696−03	1.001510−02	8.500	1.129026−12	−8.796992−12	7.748552−11
.900	9.403209−05	−8.255600−04	8.174643−03	9.000	7.233966−13	−5.631281−12	4.955634−11
.920	7.755045−05	−6.790469−04	6.706450−03	9.500	4.749677−13	−3.694326−12	3.248422−11
.940	6.425490−05	−5.611908−04	5.528671−03	10.000	3.187590−13	−2.477469−12	2.176829−11
.960	5.347465−05	−4.658911−04	4.578822−03	10.500	2.181880−13	−1.694653−12	1.488006−11
.980	4.469124−05	−3.884471−04	3.808903−03	11.000	1.520413−13	−1.180161−12	1.035616−11
1.000	3.750146−05	−3.252139−04	3.181801−03	11.500	1.076851−13	−8.353869−13	7.326564−12
1.025	3.028152−05	−2.618868−04	2.555416−03	12.000	7.741145−14	−6.002180−13	5.261341−12
1.050	2.459159−05	−2.121244−04	2.064591−03	12.500	5.641270−14	−4.371897−13	3.830445−12
1.075	2.007925−05	−1.727702−04	1.677472−03	13.000	4.162949−14	−3.224769−13	2.824133−12
1.100	1.647942−05	−1.414577−04	1.370255−03	13.500	3.107862−14	−2.406455−13	2.106614−12
1.150	1.126163−05	−9.623662−05	9.281418−04	14.000	2.345248−14	−1.815246−13	1.588457−12
1.200	7.833908−06	−6.666905−05	6.403919−04	15.000	1.375159−14	−1.063637−13	9.301030−13
1.250	5.538478−06	−4.695459−05	4.493436−04	16.000	8.348885−15	−6.453559−14	5.639890−13
1.300	3.974116−06	−3.357301−05	3.201743−04	17.000	5.225964−15	−4.037363−14	3.526408−13
1.350	2.890711−06	−2.434019−05	2.313771−04	18.000	3.360760−15	−2.595103−14	2.265573−13
1.400	2.129217−06	−1.787331−05	1.693931−04	19.000	2.213921−15	−1.708782−14	1.491145−13
1.450	1.586629−06	−1.328046−05	1.255112−04	20.000	1.490253−15	−1.149768−14	1.002931−13

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	I_5	$T^*\frac{\partial I_5}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_5}{\partial T^{*2}}$	T^*	I_5	$T^*\frac{\partial I_5}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_5}{\partial T^{*2}}$
.300	9.505024−01	−1.228546+01	1.742020+02	1.500	1.261203−08	−1.296927−07	1.471927−06
.305	7.680019−01	−9.885223+00	1.396041+02	1.550	9.005420−09	−9.240746−08	1.046562−06
.310	6.232342−01	−7.989374+00	1.123889+02	1.600	6.503705−09	−6.660256−08	7.528177−07
.315	5.078649−01	−6.484795+00	9.087678+01	1.650	4.747167−09	−4.852234−08	5.474324−07
.320	4.155133−01	−5.285265+00	7.379292+01	1.700	3.499729−09	−3.570790−08	4.021499−07
.325	3.412694−01	−4.324722+00	6.016455+01	1.750	2.604330−09	−2.652716−08	2.982567−07
.330	2.813354−01	−3.552284+00	4.924545+01	1.800	1.955144−09	−1.988276−08	2.231979−07
.335	2.327599−01	−2.928571+00	4.046039+01	1.850	1.480002−09	−1.502793−08	1.684463−07
.340	1.932387−01	−2.422957+00	3.336371+01	1.900	1.129134−09	−1.144865−08	1.281438−07
.345	1.609645−01	−2.011521+00	2.760859+01	2.000	6.717130−10	−6.792428−09	7.582601−08
.350	1.345138−01	−1.675487+00	2.292383+01	2.100	4.103733−10	−4.139600−09	4.610042−08
.360	9.481057−02	−1.173534+00	1.595864+01	2.200	2.568080−10	−2.584743−09	2.872149−08
.370	6.761052−02	−8.318594−01	1.124684+01	2.300	1.642498−10	−1.649768−09	1.829509−08
.380	4.874410−02	−5.963169−01	8.017814+00	2.400	1.071591−10	−1.074303−09	1.189130−08
.390	3.550512−02	−4.319958−01	5.777845+00	2.500	7.119486−11	−7.125057−10	7.873054−09
.400	2.611303−02	−3.160717−01	4.206120+00	2.600	4.809730−11	−4.805710−10	5.301748−09
.410	1.938114−02	−2.334246−01	3.091345+00	2.700	3.299722−11	−3.292007−10	3.626415−09
.420	1.450892−02	−1.739139−01	2.292605+00	2.800	2.296228−11	−2.287648−10	2.516546−09
.430	1.095018−02	−1.306589−01	1.714791+00	2.900	1.619141−11	−1.610978−10	1.769878−09
.440	8.328163−03	−9.893889−02	1.292990+00	3.000	1.155806−11	−1.148567−10	1.260329−09
.450	6.380369−03	−7.548143−02	9.824211−01	3.100	8.345541−12	−8.283715−11	9.079423−10
.460	4.922098−03	−5.799533−02	7.518812−01	3.200	6.090705−12	−6.039031−11	6.612037−10
.470	3.822204−03	−4.486138−02	5.794189−01	3.300	4.489829−12	−4.447187−11	4.864242−10
.480	2.986744−03	−3.492503−02	4.494508−01	3.400	3.340978−12	−3.306055−11	3.612650−10
.490	2.347872−03	−2.735604−02	3.508180−01	3.500	2.508160−12	−2.479678−11	2.707195−10
.500	1.856192−03	−2.155255−02	2.754643−01	3.600	1.898683−12	−1.875500−11	2.045834−10
.510	1.475474−03	−1.707490−02	2.175279−01	3.700	1.448644−12	−1.429782−11	1.558373−10
.520	1.178953−03	−1.359955−02	1.727112−01	3.800	1.113514−12	−1.098159−11	1.196004−10
.530	9.467146−04	−1.088672−02	1.378411−01	3.900	8.619510−13	−8.494350−12	9.244410−11
.540	7.638499−04	−8.757532−03	1.105588−01	4.000	6.716820−13	−6.614614−12	7.193671−11
.550	6.191232−04	−7.077663−03	8.909913−02	4.250	3.699077−13	−3.636866−12	3.948890−11
.560	5.040175−04	−5.745645−03	7.213303−02	4.500	2.109655−13	−2.071158−12	2.245620−11
.580	3.382056−04	−3.834870−03	4.789408−02	4.750	1.241188−13	−1.216943−12	1.317744−11
.600	2.304921−04	−2.600430−03	3.231841−02	5.000	7.508537−14	−7.353148−13	7.952895−12
.620	1.593584−04	−1.789422−03	2.213690−02	5.250	4.657578−14	−4.556274−13	4.922651−12
.640	1.116588−04	−1.248240−03	1.537503−02	5.500	2.955416−14	−2.888288−13	3.117503−12
.660	7.921569−05	−8.818440−04	1.081754−02	5.750	1.914422−14	−1.869250−13	2.015792−12
.680	5.685520−05	−6.304135−04	7.703305−03	6.000	1.263690−14	−1.232846−13	1.328403−12
.700	4.125196−05	−4.556862−04	5.547805−03	6.250	8.486855−15	−8.273348−14	8.907841−13
.720	3.023706−05	−3.328213−04	4.037864−03	6.500	5.791060−15	−5.641351−14	6.069715−13
.740	2.237621−05	−2.454630−04	2.968161−03	6.750	4.009999−15	−3.903747−14	4.197421−13
.760	1.670863−05	−1.827007−04	2.202279−03	7.000	2.814714−15	−2.738442−14	2.942654−13
.780	1.258283−05	−1.371653−04	1.648436−03	7.250	2.000816−15	−1.945477−14	2.089363−13
.800	9.551988−06	−1.038218−04	1.244148−03	7.500	1.439082−15	−1.398524−14	1.501156−13
.820	7.306309−06	−7.919158−05	9.464002−04	7.750	1.046478−15	−1.016469−14	1.090516−13
.840	5.628818−06	−6.084689−05	7.252683−04	8.000	7.688352−16	−7.464317−15	8.004297−14
.860	4.366070−06	−4.707630−05	5.597268−04	8.250	5.703181−16	−5.534504−15	5.932241−14
.880	3.408550−06	−3.666223−05	4.348626−04	8.500	4.269025−16	−4.141007−15	4.436737−14
.900	2.677421−06	−2.873079−05	3.400031−04	9.000	2.452628−16	−2.377221−15	2.545022−14
.920	2.115454−06	−2.264944−05	2.674455−04	9.500	1.452515−16	−1.406868−15	1.505127−14
.940	1.680783−06	−1.795673−05	2.115853−04	10.000	8.839479−17	−8.556238−16	9.148067−15
.960	1.342546−06	−1.431341−05	1.683130−04	10.500	5.512938−17	−5.333202−16	5.698832−15
.980	1.077839−06	−1.146834−05	1.345936−04	11.000	3.515508−17	−3.399096−16	3.630230−15
1.000	8.695369−07	−9.234215−06	1.081696−04	11.500	2.287572−17	−2.210750−16	2.359946−15
1.025	6.691683−07	−7.090008−06	8.286488−05	12.000	1.516310−17	−1.464735−16	1.562894−15
1.050	5.185300−07	−5.481877−06	6.393154−05	12.500	1.022271−17	−9.870927−17	1.052813−15
1.075	4.044373−07	−4.266703−06	4.965707−05	13.000	7.000448−18	−6.756966−17	7.204117−16
1.100	3.174146−07	−3.341895−06	3.881704−05	13.500	4.863520−18	−4.692694−17	5.001481−16
1.150	1.989571−07	−2.086806−06	2.414894−05	14.000	3.424372−18	−3.303001−17	3.519190−16
1.200	1.274183−07	−1.331803−06	1.535919−05	15.000	1.760581−18	−1.697163−17	1.807175−16
1.250	8.321995−08	−8.670313−07	9.967520−06	16.000	9.452292−19	−9.107002−18	9.692259−17
1.300	5.533902−08	−5.748302−07	6.588933−06	17.000	5.271396−19	−5.076453−18	5.400183−17
1.350	3.741237−08	−3.875384−07	4.429983−06	18.000	3.040328−19	−2.926666−18	3.112011−17
1.400	2.568163−08	−2.653352−07	3.025337−06	19.000	1.806886−19	−1.738680−18	1.848100−17
1.450	1.787967−08	−1.842798−07	2.096139−06	20.000	1.103094−19	−1.061093−18	1.127489−17

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	I_6	$T^*\frac{\partial I_6}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_6}{\partial T^{*2}}$	T^*	I_6	$T^*\frac{\partial I_6}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_6}{\partial T^{*2}}$
.300	1.779676−01	−2.651543+00	4.274749+01	1.500	1.026016−10	−1.252771−09	1.662103−08
.305	1.391819−01	−2.066103+00	3.319095+01	1.550	6.877644−11	−8.382087−10	1.110053−08
.310	1.093802−01	−1.617949+00	2.590193+01	1.600	4.672432−11	−5.684573−10	7.515219−09
.315	8.636324−02	−1.273080+00	2.031255+01	1.650	3.214317−11	−3.904176−10	5.153094−09
.320	6.849807−02	−1.006346+00	1.600435+01	1.700	2.237362−11	−2.713328−10	3.575814−09
.325	5.456522−02	−7.990370−01	1.266713+01	1.750	1.574621−11	−1.906794−10	2.509263−09
.330	4.364897−02	−6.371556−01	1.006965+01	1.800	1.119762−11	−1.354094−10	1.779484−09
.335	3.505813−02	−5.101731−01	8.038586+00	1.850	8.041322−12	−9.711284−11	1.274545−09
.340	2.826827−02	−4.101292−01	6.443324+00	1.900	5.828334−12	−7.029887−11	9.214848−10
.345	2.287958−02	−3.309756−01	5.184959+00	2.000	3.141751−12	−3.780614−11	4.944257−10
.350	1.858575−02	−2.680941−01	4.188206+00	2.100	1.747686−12	−2.098612−11	2.738797−10
.360	1.239333−02	−1.777895−01	2.762612+00	2.200	1.000229−12	−1.198741−11	1.561422−10
.370	8.374020−03	−1.195033−01	1.847475+00	2.300	5.874090−13	−7.027377−12	9.137428−11
.380	5.728819−03	−8.134786−02	1.251511+00	2.400	3.531829−13	−4.218325−12	5.476041−11
.390	3.965142−03	−5.603707−02	8.581249−01	2.500	2.169767−13	−2.587589−12	3.354062−11
.400	2.774730−03	−3.903608−02	5.951389−01	2.600	1.359637−13	−1.619179−12	2.095883−11
.410	1.961917−03	−2.748161−02	4.172110−01	2.700	8.676792−14	−1.031962−12	1.334058−11
.420	1.400847−03	−1.954112−02	2.954632−01	2.800	5.631543−14	−6.689639−13	8.637549−12
.430	1.009537−03	−1.402667−02	2.112626−01	2.900	3.712764−14	−4.405327−13	5.681681−12
.440	7.339469−04	−1.015879−02	1.524381−01	3.000	2.483673−14	−2.943825−13	3.792734−12
.450	5.380506−04	−7.420144−03	1.109461−01	3.100	1.684192−14	−1.994225−13	2.566755−12
.460	3.975732−04	−5.463629−03	8.141238−02	3.200	1.156655−14	−1.368287−13	1.759473−12
.470	2.959916−04	−4.053942−03	6.020795−02	3.300	8.038642−15	−9.501025−14	1.220659−12
.480	2.219496−04	−3.029998−03	4.485799−02	3.400	5.649521−15	−6.671681−14	8.564437−13
.490	1.675700−04	−2.280483−03	3.365864−02	3.500	4.012382−15	−4.734580−14	6.073013−13
.500	1.273418−04	−1.727801−03	2.542636−02	3.600	2.878002−15	−3.393470−14	4.349545−13
.510	9.737592−05	−1.317387−03	1.933171−02	3.700	2.083707−15	−2.455162−14	3.144659−13
.520	7.490663−05	−1.010569−03	1.478878−02	3.800	1.522011−15	−1.792120−14	2.293874−13
.530	5.795173−05	−7.797186−04	1.138033−02	3.900	1.121064−15	−1.319167−14	1.687428−13
.540	4.508023−05	−6.049554−04	8.807038−03	4.000	8.323125−16	−9.787897−15	1.251270−13
.550	3.525186−05	−4.718706−04	6.852607−03	4.250	4.082085−16	−4.793699−15	6.119619−14
.560	2.770528−05	−3.699501−04	5.359663−03	4.500	2.087171−16	−2.447921−15	3.121096−14
.580	1.735950−05	−2.307269−04	3.327469−03	4.750	1.107439−16	−1.297373−15	1.652285−14
.600	1.107331−05	−1.465356−04	2.104269−03	5.000	6.074153−17	−7.108587−16	9.043997−15
.620	7.181549−06	−9.464589−05	1.353669−03	5.250	3.432607−17	−4.013421−16	5.101395−15
.640	4.729925−06	−6.209530−05	8.847543−04	5.500	1.992999−17	−2.328230−16	2.956868−15
.660	3.160319−06	−4.133810−05	5.868939−04	5.750	1.185967−17	−1.384364−16	1.756784−15
.680	2.140119−06	−2.789710−05	3.947277−04	6.000	7.217659−18	−8.418992−17	1.067621−15
.700	1.467587−06	−1.906803−05	2.689376−04	6.250	4.484043−18	−5.226890−17	6.623889−16
.720	1.018336−06	−1.319008−05	1.854692−04	6.500	2.839095−18	−3.307384−17	4.188783−16
.740	7.144849−07	−9.227226−06	1.293720−04	6.750	1.829348−18	−2.129859−17	2.695916−16
.760	5.065575−07	−6.523659−06	9.121496−05	7.000	1.198002−18	−1.394052−17	1.763615−16
.780	3.626948−07	−4.658502−06	6.496564−05	7.250	7.964578−19	−9.263317−18	1.171320−16
.800	2.621169−07	−3.358121−06	4.671423−05	7.500	5.369851−19	−6.242549−18	7.889849−17
.820	1.911054−07	−2.442422−06	3.389519−05	7.750	3.668185−19	−4.262451−18	5.384886−17
.840	1.404996−07	−1.791497−06	2.480525−05	8.000	2.536670−19	−2.946403−18	3.720751−17
.860	1.041157−07	−1.324629−06	1.830100−05	8.250	1.774471−19	−2.060285−18	2.600744−17
.880	7.773659−08	−9.869188−07	1.360677−05	8.500	1.254770−19	−1.456339−18	1.837697−17
.900	5.845806−08	−7.406557−07	1.019109−05	9.000	6.464726−20	−7.498133−19	9.455234−18
.920	4.426134−08	−5.596914−07	7.686322−06	9.500	3.453725−20	−4.003365−19	5.045233−18
.940	3.373103−08	−4.257350−07	5.835904−06	10.000	1.906094−20	−2.208216−19	2.781373−18
.960	2.586610−08	−3.258804−07	4.459199−06	10.500	1.083247−20	−1.254314−19	1.579093−18
.980	1.995304−08	−2.509480−07	3.428007−06	11.000	6.321829−21	−7.316810−20	9.207150−19
1.000	1.547934−08	−1.943581−07	2.650619−06	11.500	3.779676−21	−4.372708−20	5.500124−19
1.025	1.135635−08	−1.423052−07	1.936915−06	12.000	2.310265−21	−2.671708−20	3.359262−19
1.050	8.398913−09	−1.050450−07	1.427081−06	12.500	1.441034−21	−1.665888−20	2.093853−19
1.075	6.259350−09	−7.814268−08	1.059693−06	13.000	9.157891−22	−1.058334−20	1.329781−19
1.100	4.698877−09	−5.855899−08	7.927513−07	13.500	5.921185−22	−6.840718−21	8.592627−20
1.150	2.702737−09	−3.357200−08	4.530181−07	14.000	3.890134−22	−4.492960−21	5.641997−20
1.200	1.594269−09	−1.974335−08	2.656219−07	15.000	1.753847−22	−2.024572−21	2.541026−20
1.250	9.623170−10	−1.188398−08	1.594435−07	16.000	8.327489−23	−9.608514−22	1.205409−20
1.300	5.932559−10	−7.307325−09	9.778940−08	17.000	4.137948−23	−4.772547−22	5.984845−21
1.350	3.729073−10	−4.582141−09	6.117409−08	18.000	2.140584−23	−2.467966−22	3.093747−21
1.400	2.386418−10	−2.925741−09	3.897356−08	19.000	1.147768−23	−1.322874−22	1.657765−21
1.450	1.552754−10	−1.899666−09	2.525278−08	20.000	6.355404−24	−7.322824−23	9.173927−22

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function*—Continued

$m=60$

T^*	I_7	$T^*\frac{\partial I_7}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_7}{\partial T^{*2}}$	T^*	I_7	$T^*\frac{\partial I_7}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_7}{\partial T^{*2}}$
.300	2.599300−02	−4.382705−01	7.915025+00	1.500	6.604602−13	−9.333241−12	1.416988−10
.305	1.967955−02	−3.307385−01	5.954026+00	1.550	4.156950−13	−5.864734−12	8.889507−11
.310	1.498030−02	−2.509658−01	4.503978+00	1.600	2.657034−13	−3.742831−12	5.664565−11
.315	1.146265−02	−1.914445−01	3.425455+00	1.650	1.722991−13	−2.423563−12	3.662650−11
.320	8.815093−03	−1.467084−01	2.618733+00	1.700	1.132513−13	−1.590807−12	2.400867−11
.325	6.811892−03	−1.131003−01	2.012028+00	1.750	7.539157−14	−1.057627−12	1.594133−11
.330	5.288515−03	−8.755907−02	1.553352+00	1.800	5.079237−14	−7.116608−13	1.071360−11
.335	4.124343−03	−6.809677−02	1.204830+00	1.850	3.460781−14	−4.843295−13	7.282844−12
.340	3.230457−03	−5.319512−02	9.387117−01	1.900	2.383298−14	−3.331676−13	5.004322−12
.345	2.540963−03	−4.173233−02	7.345543−01	2.000	1.164379−14	−1.624360−13	2.434879−12
.350	2.006769−03	−3.287512−02	5.772153−01	2.100	5.898940−15	−8.213834−14	1.228948−12
.360	1.266376−03	−2.064463−02	3.607422−01	2.200	3.088161−15	−4.292658−14	6.411736−13
.370	8.110211−04	−1.315998−02	2.289105−01	2.300	1.665573−15	−2.311564−14	3.447289−13
.380	5.266438−04	−8.507760−03	1.473466−01	2.400	9.230588−16	−1.279208−14	1.904974−13
.390	3.464669−04	−5.573458−03	9.612836−02	2.500	5.244492−16	−7.258264−15	1.079453−13
.400	2.307498−04	−3.697027−03	6.351299−02	2.600	3.048689−16	−4.214076−15	6.259480−14
.410	1.554739−04	−2.481388−03	4.246819−02	2.700	1.810034−16	−2.499044−15	3.707766−14
.420	1.059098−04	−1.684116−03	2.871910−02	2.800	1.095821−16	−1.511327−15	2.239923−14
.430	7.289948−05	−1.155119−03	1.963007−02	2.900	6.755545−17	−9.307686−16	1.378107−14
.440	5.067445−05	−8.002427−04	1.355423−02	3.000	4.235474−17	−5.830065−16	8.623990−15
.450	3.555608−05	−5.596760−04	9.449449−03	3.100	2.697563−17	−3.709865−16	5.482916−15
.460	2.517091−05	−3.949734−04	6.648273−03	3.200	1.743514−17	−2.395796−16	3.537892−15
.470	1.797043−05	−2.811424−04	4.718351−03	3.300	1.142513−17	−1.568716−16	2.314732−15
.480	1.293360−05	−2.017603−04	3.376534−03	3.400	7.584261−18	−1.040577−16	1.534303−15
.490	9.380380−06	−1.459259−04	2.435482−03	3.500	5.096226−18	−6.987224−17	1.029532−15
.500	6.853487−06	−1.063318−04	1.770013−03	3.600	3.463882−18	−4.746029−17	6.988422−16
.510	5.042571−06	−7.803429−05	1.295686−03	3.700	2.380005−18	−3.258900−17	4.795659−16
.520	3.735170−06	−5.765872−05	9.550354−04	3.800	1.652102−18	−2.260840−17	3.324981−16
.530	2.784602−06	−4.288215−05	7.086108−04	3.900	1.157990−18	−1.583762−17	2.327897−16
.540	2.088790−06	−3.209241−05	5.291089−04	4.000	8.191504−19	−1.119729−17	1.644951−16
.550	1.576146−06	−2.416195−05	3.974835−04	4.250	3.578409−19	−4.885352−18	7.167980−17
.560	1.196096−06	−1.829622−05	3.003478−04	4.500	1.640523−19	−2.237185−18	3.278844−17
.580	7.000485−07	−1.066433−05	1.743557−04	4.750	7.851138−20	−1.069583−18	1.566028−17
.600	4.180938−07	−6.344528−06	1.033355−04	5.000	3.904759−20	−5.314718−19	7.774499−18
.620	2.544314−07	−3.846955−06	6.243290−05	5.250	2.010527−20	−2.734234−19	3.996415−18
.640	1.575625−07	−2.374167−06	3.840109−05	5.500	1.068211−20	−1.451623−19	2.120130−18
.660	9.917675−08	−1.489582−06	2.401676−05	5.750	5.839902−21	−7.930495−20	1.157469−18
.680	6.338426−08	−9.490925−07	1.525639−05	6.000	3.277062−21	−4.447351−20	6.486864−19
.700	4.109133−08	−6.135082−07	9.833898−06	6.250	1.883460−21	−2.554561−20	3.723874−19
.720	2.699833−08	−4.019899−07	6.426085−06	6.500	1.106611−21	−1.500087−20	2.185541−19
.740	1.796369−08	−2.667731−07	4.253615−06	6.750	6.635418−22	−8.990186−21	1.309156−19
.760	1.209513−08	−1.791763−07	2.849942−06	7.000	4.054397−22	−5.490606−21	7.991688−20
.780	8.235548−09	−1.217131−07	1.931447−06	7.250	2.521084−22	−3.412625−21	4.964958−20
.800	5.667286−09	−8.356856−08	1.323198−06	7.500	1.593419−22	−2.156009−21	3.135439−20
.820	3.939251−09	−5.796272−08	9.158224−07	7.750	1.022550−22	−1.383043−21	2.010551−20
.840	2.764280−09	−4.059065−08	6.400439−07	8.000	6.656201−23	−8.999494−22	1.307794−20
.860	1.957366−09	−2.868557−08	4.514467−07	8.250	4.391075−23	−5.934884−22	8.621534−21
.880	1.397942−09	−2.044863−08	3.212197−07	8.500	2.933376−23	−3.963393−22	5.755707−21
.900	1.006593−09	−1.469761−08	2.304692−07	9.000	1.355404−23	−1.830236−22	2.656313−21
.920	7.304662−10	−1.064737−08	1.666741−07	9.500	6.532572−24	−8.816319−23	1.278870−21
.940	5.340378−10	−7.771298−09	1.214530−07	10.000	3.269774−24	−4.410705−23	6.394932−22
.960	3.932097−10	−5.712856−09	8.914241−08	10.500	1.693372−24	−2.283227−23	3.308911−22
.980	2.914884−10	−4.228480−09	6.588067−08	11.000	9.044810−25	−1.219044−23	1.765957−22
1.000	2.174886−10	−3.150347−09	4.901164−08	11.500	4.968859−25	−6.694446−24	9.694250−23
1.025	1.521381−10	−2.199841−09	3.416439−08	12.000	2.800763−25	−3.772117−24	5.460552−23
1.050	1.074092−10	−1.550460−09	2.403910−08	12.500	1.616369−25	−2.176262−24	3.149385−23
1.075	7.649734−11	−1.102462−09	1.706585−08	13.000	9.533213−26	−1.283164−24	1.856393−23
1.100	5.493737−11	−7.905200−10	1.221838−08	13.500	5.736615−26	−7.719334−25	1.116477−23
1.150	2.900565−11	−4.161651−10	6.413866−09	14.000	3.516829−26	−4.731127−25	6.841077−24
1.200	1.576321−11	−2.255614−10	3.467129−09	15.000	1.390450−26	−1.869684−25	2.702273−24
1.250	8.795756−12	−1.255503−10	1.925132−09	16.000	5.839039−27	−7.848338−26	1.133870−24
1.300	5.028293−12	−7.160900−11	1.095530−09	17.000	2.585322−27	−3.473715−26	5.016770−25
1.350	2.939353−12	−4.177060−11	6.376910−10	18.000	1.199588−27	−1.611281−26	2.326282−25
1.400	1.753989−12	−2.487600−11	3.790219−10	19.000	5.803380−28	−7.792812−27	1.124760−25
1.450	1.066812−12	−1.510192−11	2.296762−10	20.000	2.914687−28	−3.912830−27	5.646032−26

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	I_8	$T^*\frac{\partial I_8}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_8}{\partial T^{*2}}$	T^*	I_8	$T^*\frac{\partial I_8}{\partial T^*}$	$T^{*2}\frac{\partial^2 I_8}{\partial T^{*2}}$
.300	3.043474−03	−5.726215−02	1.144912+00	1.500	3.442164−15	−5.524372−14	9.443740−13
.305	2.231031−03	−4.185274−02	8.343968−01	1.550	2.034484−15	−3.260364−14	5.565366−13
.310	1.645203−03	−3.077478−02	6.118212−01	1.600	1.223612−15	−1.958185−14	3.337991−13
.315	1.220160−03	−2.276066−02	4.512633−01	1.650	7.480252−16	−1.195525−14	2.035298−13
.320	9.099293−04	−1.692788−02	3.347314−01	1.700	4.643366−16	−7.412070−15	1.260311−13
.325	6.821938−04	−1.265792−02	2.496529−01	1.750	2.924113−16	−4.662230−15	7.918259−14
.330	5.140869−04	−9.514406−03	1.871832−01	1.800	1.866531−16	−2.972723−15	5.043294−14
.335	3.893296−04	−7.187588−03	1.410616−01	1.850	1.206765−16	−1.919932−15	3.253823−14
.340	2.962635−04	−5.456238−03	1.068285−01	1.900	7.896781−17	−1.255105−15	2.125000−14
.345	2.264904−04	−4.161424−03	8.128890−02	2.000	3.497213−17	−5.548137−16	9.376226−15
.350	1.739269−04	−3.188322−03	6.214021−02	2.100	1.613804−17	−2.555898−16	4.312194−15
.360	1.038935−04	−1.896121−03	3.679534−02	2.200	7.729001−18	−1.222212−16	2.058912−15
.370	6.307787−05	−1.146388−03	2.215473−02	2.300	3.828792−18	−6.046036−17	1.017075−15
.380	3.888730−05	−7.039249−04	1.355050−02	2.400	1.956060−18	−3.084787−17	5.182583−16
.390	2.432163−05	−4.385876−04	8.411210−03	2.500	1.027925−18	−1.619129−17	2.716964−16
.400	1.541971−05	−2.770516−04	5.294319−03	2.600	5.543862−19	−8.722635−18	1.462074−16
.410	9.902206−06	−1.772996−04	3.376550−03	2.700	3.062403−19	−4.813343−18	8.059743−17
.420	6.436648−06	−1.148663−04	2.180412−03	2.800	1.729562−19	−2.715816−18	4.543157−17
.430	4.232361−06	−7.528939−05	1.424691−03	2.900	9.971079−20	−1.564276−18	2.614455−17
.440	2.813487−06	−4.989674−05	9.413610−04	3.000	5.859491−20	−9.184661−19	1.533789−17
.450	1.889775−06	−3.341697−05	6.286385−04	3.100	3.505359−20	−5.490225−19	9.161147−18
.460	1.281907−06	−2.260447−05	4.240608−04	3.200	2.132339−20	−3.337251−19	5.564499−18
.470	8.777727−07	−1.543648−05	2.888210−04	3.300	1.317576−20	−2.060638−19	3.433484−18
.480	6.064512−07	−1.063740−05	1.985210−04	3.400	8.261830−21	−1.291258−19	2.150102−18
.490	4.225914−07	−7.393942−06	1.376509−04	3.500	5.252675−21	−8.204340−20	1.365269−18
.500	2.968871−07	−5.182058−06	9.624464−05	3.600	3.383323−21	−5.281379−20	8.783440−19
.510	2.102096−07	−3.660641−06	6.783279−05	3.700	2.206221−21	−3.441968−20	5.721107−19
.520	1.499547−07	−2.605515−06	4.817476−05	3.800	1.455482−21	−2.269504−20	3.770268−19
.530	1.077401−07	−1.867987−06	3.446486−05	3.900	9.708438−22	−1.513043−20	2.512302−19
.540	7.794300−08	−1.348555−06	2.483015−05	4.000	6.543802−22	−1.019343−20	1.691728−19
.550	5.675959−08	−9.800680−07	1.800963−05	4.250	2.546424−22	−3.962167−21	6.568388−20
.560	4.159594−08	−7.168401−07	1.314732−05	4.500	1.046835−22	−1.627211−21	2.694862−20
.580	2.274590−08	−3.905387−07	7.136598−06	4.750	4.519104−23	−7.018186−22	1.161255−20
.600	1.272189−08	−2.176716−07	3.964048−06	5.000	2.038177−23	−3.162705−22	5.228877−21
.620	7.266030−09	−1.239159−07	2.249383−06	5.250	9.562338−24	−1.482715−22	2.449549−21
.640	4.231684−09	−7.194579−08	1.302032−06	5.500	4.649455−24	−7.204436−23	1.189420−21
.660	2.509774−09	−4.254656−08	7.677768−07	5.750	2.335383−24	−3.616472−23	5.966934−22
.680	1.514087−09	−2.559690−08	4.606596−07	6.000	1.208412−24	−1.870219−23	3.083974−22
.700	9.281092−10	−1.564969−08	2.809203−07	6.250	6.425489−25	−9.939233−24	1.638107−22
.720	5.775082−10	−9.713896−09	1.739455−07	6.500	3.503420−25	−5.416578−24	8.922818−23
.740	3.644551−10	−6.115923−09	1.092640−07	6.750	1.954974−25	−3.021170−24	4.974561−23
.760	2.330804−10	−3.902620−09	6.956903−08	7.000	1.114583−25	−1.721715−24	2.833721−23
.780	1.509458−10	−2.522032−09	4.486425−08	7.250	6.482543−26	−1.000970−24	1.646815−23
.800	9.892236−11	−1.649475−09	2.928385−08	7.500	3.841015−26	−5.928702−25	9.750398−24
.820	6.556213−11	−1.091105−09	1.933396−08	7.750	2.315688−26	−3.573069−25	5.874258−24
.840	4.391830−11	−7.295551−10	1.290390−08	8.000	1.418941−26	−2.188681−25	3.597095−24
.860	2.971930−11	−4.928164−10	8.701442−09	8.250	8.827968−27	−1.361269−25	2.236554−24
.880	2.030562−11	−3.361472−10	5.925306−09	8.500	5.571482−27	−8.588682−26	1.410702−24
.900	1.400165−11	−2.314140−10	4.072641−09	9.000	2.308919−27	−3.557377−26	5.839904−25
.920	9.739586−12	−1.607225−10	2.824207−09	9.500	1.003971−27	−1.546078−26	2.536867−25
.940	6.831668−12	−1.125682−10	1.975129−09	10.000	4.557737−28	−7.015657−27	1.150654−25
.960	4.830318−12	−7.947718−11	1.392538−09	10.500	2.151054−28	−3.309761−27	5.426258−26
.980	3.441408−12	−5.654634−11	9.894129−10	11.000	1.051587−28	−1.617454−27	2.650807−26
1.000	2.469825−12	−4.052833−11	7.082103−10	11.500	5.308372−29	−8.162108−28	1.337223−26
1.025	1.647533−12	−2.699209−11	4.709312−10	12.000	2.759346−29	−4.241438−28	6.946748−27
1.050	1.110468−12	−1.816557−11	3.164592−10	12.500	1.473443−29	−2.264209−28	3.707335−27
1.075	7.558886−13	−1.234725−11	2.147905−10	13.000	8.065297−30	−1.239050−28	2.028244−27
1.100	5.193760−13	−8.472091−12	1.471764−10	13.500	4.516999−30	−6.937638−29	1.135369−27
1.150	2.517609−13	−4.096035−12	7.097247−11	14.000	2.584012−30	−3.967863−29	6.492070−28
1.200	1.260768−13	−2.046285−12	3.537193−11	15.000	8.959677−31	−1.375228−29	2.249170−28
1.250	6.504451−14	−1.053358−12	1.816823−11	16.000	3.327796−31	−5.105995−30	8.347773−29
1.300	3.448670−14	−5.573412−13	9.593365−12	17.000	1.312942−31	−2.013855−30	3.291385−29
1.350	1.875084−14	−3.024523−13	5.196151−12	18.000	5.464428−32	−8.379182−31	1.369074−29
1.400	1.043488−14	−1.680143−13	2.881386−12	19.000	2.385238−32	−3.656582−31	5.972939−30
1.450	5.933505−15	−9.537699−14	1.632974−12	20.000	1.086611−32	−1.665387−31	2.719732−30

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	I_9	$T^* \frac{\partial I_9}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_9}{\partial T^{*2}}$	T^*	I_9	$T^* \frac{\partial I_9}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_9}{\partial T^{*2}}$
.300	2.921130−04	−6.064856−03	1.329778−01	1.500	1.481252−17	−2.660952−16	5.057296−15
.305	2.073528−04	−4.293490−03	9.388992−02	1.550	8.222107−18	−1.475062−16	2.799725−15
.310	1.481416−04	−3.059445−03	6.673207−02	1.600	4.653446−18	−8.337869−17	1.580586−15
.315	1.065002−04	−2.193884−03	4.773326−02	1.650	2.682050−18	−4.799896−17	9.088323−16
.320	7.702529−05	−1.582799−03	3.435414−02	1.700	1.572430−18	−2.810927−17	5.316413−16
.325	5.603182−05	−1.148645−03	2.487222−02	1.750	9.367932−19	−1.672868−17	3.160631−16
.330	4.098900−05	−8.383125−04	1.811081−02	1.800	5.666026−19	−1.010788−17	1.907829−16
.335	3.014733−05	−6.151803−04	1.326065−02	1.850	3.476197−19	−6.195436−18	1.168263−16
.340	2.228952−05	−4.538325−04	9.761440−03	1.900	2.161627−19	−3.849062−18	7.251589−17
.345	1.656336−05	−3.365193−04	7.222860−03	2.000	8.678737−20	−1.542764−18	2.901699−17
.350	1.236862−05	−2.507688−04	5.371275−03	2.100	3.648196−20	−6.475242−19	1.216042−17
.360	6.994768−06	−1.412461−04	3.013404−03	2.200	1.598592−20	−2.833398−19	5.313699−18
.370	4.026728−06	−8.100139−05	1.721612−03	2.300	7.274242−21	−1.287656−19	2.411768−18
.380	2.357207−06	−4.724491−05	1.000549−03	2.400	3.426077−21	−6.057526−20	1.133237−18
.390	1.401809−06	−2.799868−05	5.909274−04	2.500	1.665380−21	−2.941281−20	5.496557−19
.400	8.461362−07	−1.684417−05	3.543457−04	2.600	8.333653−22	−1.470342−20	2.744956−19
.410	5.179613−07	−1.027854−05	2.155527−04	2.700	4.283407−22	−7.550276−21	1.408229−19
.420	3.213172−07	−6.357016−06	1.329165−04	2.800	2.256890−22	−3.974679−21	7.406851−20
.430	2.018595−07	−3.982079−06	8.302213−05	2.900	1.216816−22	−2.141213−21	3.986917−20
.440	1.283411−07	−2.524760−06	5.249457−05	3.000	6.702582−23	−1.178536−21	2.192746−20
.450	8.253214−08	−1.619275−06	3.357948−05	3.100	3.766508−23	−6.617986−22	1.230438−20
.460	5.365182−08	−1.049957−06	2.171847−05	3.200	2.156517−23	−3.786559−22	7.035344−21
.470	3.523927−08	−6.879345−07	1.419554−05	3.300	1.256536−23	−2.204898−22	4.094047−21
.480	2.337452−08	−4.552365−07	9.371938−06	3.400	7.442898−24	−1.305247−22	2.422123−21
.490	1.565089−08	−3.041208−07	6.246892−06	3.500	4.477466−24	−7.847558−23	1.455429−21
.500	1.057390−08	−2.050178−07	4.202144−06	3.600	2.733128−24	−4.787699−23	8.874615−22
.510	7.205472−09	−1.394127−07	2.851525−06	3.700	1.691499−24	−2.961523−23	5.486761−22
.520	4.950652−09	−9.559138−08	1.951286−06	3.800	1.060579−24	−1.855983−23	3.436878−22
.530	3.428362−09	−6.606785−08	1.346015−06	3.900	6.732469−25	−1.177616−23	2.179682−22
.540	2.392191−09	−4.601248−08	9.356686−07	4.000	4.324047−25	−7.560096−24	1.398704−22
.550	1.681351−09	−3.228066−08	6.552435−07	4.250	1.498981−25	−2.618122−24	4.838916−23
.560	1.190012−09	−2.280688−08	4.621319−07	4.500	5.526202−26	−9.643264−25	1.780690−23
.580	6.080905−10	−1.161495−08	2.345687−07	4.750	2.152035−26	−3.752234−25	6.923088−24
.600	3.185594−10	−6.065481−09	1.221124−07	5.000	8.802162−27	−1.533582−25	2.827457−24
.620	1.707860−10	−3.242165−09	6.508077−08	5.250	3.763037−27	−6.551826−26	1.207146−24
.640	9.355489−11	−1.771057−09	3.545253−08	5.500	1.674506−27	−2.913682−26	5.365039−25
.660	5.228936−11	−9.872593−10	1.971110−08	5.750	7.728012−28	−1.343932−26	2.473223−25
.680	2.978054−11	−5.608739−10	1.117048−08	6.000	3.687385−28	−6.409162−27	1.178860−25
.700	1.726298−11	−3.243553−10	6.444831−09	6.250	1.814028−28	−3.151499−27	5.793886−26
.720	1.017420−11	−1.907355−10	3.781452−09	6.500	9.178912−29	−1.593934−27	2.929073−26
.740	6.090658−12	−1.139385−10	2.254148−09	6.750	4.766814−29	−8.274217−28	1.519873−26
.760	3.700165−12	−6.907929−11	1.363923−09	7.000	2.535860−29	−4.400032−28	8.079213−27
.780	2.279381−12	−4.247235−11	8.369888−10	7.250	1.379562−29	−2.392844−28	4.392092−27
.800	1.422740−12	−2.646165−11	5.205237−10	7.500	7.663204−30	−1.328729−28	2.438075−27
.820	8.991823−13	−1.669464−11	3.278285−10	7.750	4.340440−30	−7.523528−29	1.380050−27
.840	5.750483−13	−1.065874−11	2.089561−10	8.000	2.503628−30	−4.338379−29	7.955575−28
.860	3.719122−13	−6.882494−12	1.347119−10	8.250	1.469017−30	−2.544849−29	4.665352−28
.880	2.431183−13	−4.492173−12	8.779238−11	8.500	8.759077−31	−1.516973−29	2.780258−28
.900	1.605518−13	−2.962206−12	5.780735−11	9.000	3.255730−31	−5.635790−30	1.032406−28
.920	1.070599−13	−1.972488−12	3.843930−11	9.500	1.277239−31	−2.209973−30	4.046615−29
.940	7.205463−14	−1.325748−12	2.580118−11	10.000	5.259049−32	−9.095958−31	1.664873−29
.960	4.892612−14	−8.990305−13	1.747404−11	10.500	2.261975−32	−3.910852−31	7.155617−30
.980	3.350398−14	−6.148743−13	1.193622−11	11.000	1.012136−32	−1.749357−31	3.199712−30
1.000	2.312981−14	−4.239736−13	8.220550−12	11.500	4.694870−33	−8.112052−32	1.483310−30
1.025	1.471445−14	−2.693293−13	5.214641−12	12.000	2.250620−33	−3.887654−32	7.106696−31
1.050	9.469350−15	−1.730855−13	3.346632−12	12.500	1.111989−33	−1.920320−32	3.509473−31
1.075	6.161021−15	−1.124657−13	2.171701−12	13.000	5.649156−34	−9.753315−33	1.782038−31
1.100	4.050534−15	−7.384675−14	1.424189−12	13.500	2.944648−34	−5.082825−33	9.284820−32
1.150	1.802904−15	−3.279156−14	6.309256−13	14.000	1.571930−34	−2.712781−33	4.954426−32
1.200	8.320744−16	−1.510090−14	2.899203−13	15.000	4.780099−35	−8.246221−34	1.505466−32
1.250	3.969525−16	−7.189552−15	1.377552−13	16.000	1.570327−35	−2.708097−34	4.942391−33
1.300	1.952197−16	−3.529174−15	6.749516−14	17.000	5.520823−36	−9.518095−35	1.736584−33
1.350	9.873650−17	−1.781846−15	3.401883−14	18.000	2.061072−36	−3.552426−35	6.479733−34
1.400	5.124830−17	−9.233494−16	1.760011−14	19.000	8.117560−37	−1.398796−35	2.550847−34
1.450	2.724633−17	−4.901563−16	9.328875−15	20.000	3.354332−37	−5.778858−36	1.053609−34

TABLE 3. *Second virial coefficients, I_k integrals and their first and second derivatives for (m, 6, 3) potential function* — Continued

$m=60$

T^*	I_{10}	$T^* \frac{\partial I_{10}}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_{10}}{\partial T^{*2}}$	T^*	I_{10}	$T^* \frac{\partial^2 I_{10}}{\partial T^*}$	$T^{*2} \frac{\partial^2 I_{10}}{\partial T^{*2}}$
.300	2.340906−05	−5.314871−04	1.267881−02	1.500	5.351500−20	−1.063735−18	2.224830−17
.305	1.609168−05	−3.644461−04	8.672762−03	1.550	2.789892−20	−5.538764−19	1.157038−17
.310	1.113927−05	−2.516768−04	5.974982−03	1.600	1.485962−20	−2.946673−19	6.148501−18
.315	7.763193−06	−1.749894−04	4.144805−03	1.650	8.075030−21	−1.599543−19	3.333989−18
.320	5.445638−06	−1.224711−04	2.894367−03	1.700	4.471567−21	−8.848412−20	1.842428−18
.325	3.844005−06	−8.626017−05	2.034157−03	1.750	2.520378−21	−4.982520−20	1.036466−18
.330	2.729936−06	−6.112891−05	1.438472−03	1.800	1.444492−21	−2.852979−20	5.929356−19
.335	1.950140−06	−4.357658−05	1.023324−03	1.850	8.410070−22	−1.659601−20	3.446161−19
.340	1.401004−06	−3.124239−05	7.322068−04	1.900	4.969860−22	−9.799127−21	2.033111−19
.345	1.012031−06	−2.252368−05	5.268428−04	2.000	1.809086−22	−3.561495−21	7.378034−20
.350	7.349397−07	−1.632528−05	3.811331−04	2.100	6.927978−23	−1.361977−21	2.817556−20
.360	3.935424−07	−8.709452−06	2.025901−04	2.200	2.777684−23	−5.453671−22	1.126777−20
.370	2.148404−07	−4.737895−06	1.098254−04	2.300	1.161107−23	−2.277021−22	4.699029−21
.380	1.194343−07	−2.625080−06	6.064881−05	2.400	5.041921−24	−9.876882−23	2.036072−21
.390	6.754260−08	−1.479802−06	3.408107−05	2.500	2.267112−24	−4.436714−23	9.136971−22
.400	3.881917−08	−8.479072−07	1.946931−05	2.600	1.052660−24	−2.058131−23	4.234604−22
.410	2.265438−08	−4.933895−07	1.129648−05	2.700	5.034623−25	−9.835050−24	2.021825−22
.420	1.341355−08	−2.913214−07	6.651683−06	2.800	2.474874−25	−4.830731−24	9.922754−23
.430	8.051851−09	−1.744083−07	3.971761−06	2.900	1.247944−25	−2.434042−24	4.996000−23
.440	4.896748−09	−1.057963−07	2.403206−06	3.000	6.443601−26	−1.255900−24	2.575995−23
.450	3.015095−09	−6.498313−08	1.472551−06	3.100	3.401461−26	−6.625281−25	1.358027−23
.460	1.878524−09	−4.039205−08	9.131809−07	3.200	1.833094−26	−3.568231−25	7.309509−24
.470	1.183627−09	−2.539297−08	5.728030−07	3.300	1.007218−26	−1.959462−25	4.011609−24
.480	7.538246−10	−1.613713−08	3.632338−07	3.400	5.635996−27	−1.095830−25	2.242258−24
.490	4.850365−10	−1.036152−08	2.327483−07	3.500	3.208187−27	−6.234537−26	1.275030−24
.500	3.151605−10	−6.719041−09	1.506283−07	3.600	1.855941−27	−3.604898−26	7.368763−25
.510	2.067089−10	−4.398382−09	9.841468−08	3.700	1.090168−27	−2.116497−26	4.324300−25
.520	1.367997−10	−2.905408−09	6.488902−08	3.800	6.496642−28	−1.260720−26	2.574681−25
.530	9.131636−11	−1.935919−09	4.315951−08	3.900	3.924819−28	−7.613147−27	1.554122−25
.540	6.146083−11	−1.300711−09	2.894820−08	4.000	2.402043−28	−4.657459−27	9.503743−26
.550	4.169578−11	−8.809342−10	1.957318−08	4.250	7.418473−29	−1.437066−27	2.929669−26
.560	2.850335−11	−6.012299−10	1.333703−08	4.500	2.452724−29	−4.747308−28	9.670036−27
.580	1.361240−11	−2.862423−10	6.330255−09	4.750	8.616652−30	−1.666519−28	3.392078−27
.600	6.680125−12	−1.400625−10	3.088591−09	5.000	3.196290−30	−6.177632−29	1.256561−27
.620	3.362125−12	−7.030157−11	1.546071−09	5.250	1.245195−30	−2.405160−29	4.889199−28
.640	1.732506−12	−3.613341−11	7.926248−10	5.500	5.071185−31	−9.789718−30	1.988930−28
.660	9.126273−13	−1.898776−11	4.155172−10	5.750	2.150446−31	−4.149194−30	8.425365−29
.680	4.907494−13	−1.018695−11	2.224196−10	6.000	9.462044−32	−1.824788−30	3.703657−29
.700	2.690420−13	−5.572646−12	1.214106−10	6.250	4.306809−32	−8.302159−31	1.684297−29
.720	1.502002−13	−3.104687−12	6.750371−11	6.500	2.022435−32	−3.897015−31	7.902831−30
.740	8.530032−14	−1.759743−12	3.818724−11	6.750	9.774831−33	−1.882788−31	3.816696−30
.760	4.923111−14	−1.013751−12	2.195840−11	7.000	4.852224−33	−9.342837−32	1.893266−30
.780	2.885034−14	−5.930267−13	1.282279−11	7.250	2.469153−33	−4.752716−32	9.627896−31
.800	1.715259−14	−3.519821−13	7.598067−12	7.500	1.285859−33	−2.474301−32	5.010809−31
.820	1.033822−14	−2.118059−13	4.564866−12	7.750	6.842481−34	−1.316273−32	2.664865−31
.840	6.312468−15	−1.291289−13	2.778765−12	8.000	3.715422−34	−7.145312−33	1.446212−31
.860	3.902190−15	−7.970655−14	1.712732−12	8.250	2.056044−34	−3.953059−33	7.998941−32
.880	2.440695−15	−4.978377−14	1.068260−12	8.500	1.158221−34	−2.226313−33	4.503810−32
.900	1.543737−15	−3.144572−14	6.738604−13	9.000	3.861402−35	−7.418986−34	1.500182−32
.920	9.868755−16	−2.007653−14	4.296747−13	9.500	1.366753−35	−2.624907−34	5.305652−33
.940	6.373409−16	−1.294966−14	2.768054−13	10.000	5.104362−36	−9.799554−35	1.980036−33
.960	4.156285−16	−8.434773−15	1.800842−13	10.500	2.000825−36	−3.839984−35	7.756260−34
.980	2.735774−16	−5.545613−15	1.182653−13	11.000	8.194553−37	−1.572220−35	3.174717−34
1.000	1.816874−16	−3.678869−15	7.836933−14	11.500	3.492893−37	−6.699654−36	1.352457−34
1.025	1.102373−16	−2.229168−15	4.742466−14	12.000	1.544203−37	−2.961146−36	5.976128−35
1.050	6.773853−17	−1.368046−15	2.906813−14	12.500	7.059601−38	−1.353420−36	2.730801−35
1.075	4.212840−17	−8.497953−16	1.803473−14	13.000	3.328621−38	−6.380008−37	1.287016−35
1.100	2.650298−17	−5.339876−16	1.131951−14	13.500	1.614878−38	−3.094622−37	6.241398−36
1.150	1.083317−17	−2.177950−16	4.606889−15	14.000	8.044515−39	−1.541293−37	3.107971−36
1.200	4.608201−18	−9.245992−17	1.951867−15	15.000	2.145448−39	−4.109164−38	8.283166−37
1.250	2.033054−18	−4.071613−17	8.579560−16	16.000	0.000000	0.000000	0.000000
1.300	9.275032−19	−1.854330−17	3.900722−16	17.000	0.000000	0.000000	0.000000
1.350	4.364051−19	−8.710986−18	1.829518−16	18.000	0.000000	0.000000	0.000000
1.400	2.112808−19	−4.211048−18	8.831148−17	19.000	0.000000	0.000000	0.000000
1.450	1.050326−19	−2.090495−18	4.377997−17	20.000	0.000000	0.000000	0.000000

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Publications of the National Bureau of Standards*

Selected Abstracts

Abramowitz, S., Levin, I. W., **Raman spectra of the hexahalogenated benzenes in the solid phase,** *Spectrochim. Acta.* **26A,** *2261–2268 (1970).*

Key words: C_6F_6; C_6Cl_6; C_6Br_6; C_6I_6; hexahalogenated benzenes; laser; raman; vibrational assignment.

Solid Raman spectra of the hexahalogenated benzenes are examined at both room and liquid nitrogen temperatures. Tentative assignments for C_6Cl_6, C_6Br_6, and C_6I_6 are proposed on the basis of a puckered (D_{3d}) geometry.

Allpress, J. G., Roth, R. S., **Structural studies by electron microscopy: Polymorphism of $ZrO_2 \cdot 12Nb_2O_5$,** *J. Solid State Chem.* **2,** *366–376 (1970).*

Key words: Electron microscopy; lattice images; niobia; polymorphism; zirconia; $ZrO_2 \cdot 12Nb_2O_5$.

Three polymorphs of $ZrO_2 \cdot 12Nb_2O_5$ have been identified by the combined use of x-ray diffraction and electron optical techniques. The α form, which is the initial product of the reaction of ZrO_2 with Nb_2O_5 in the molar ratio 1:12, is isostructural with $TiNb_{24}O_{62}$. The monoclinic β form, produced by long annealing, has a more complex structure, and may contain intergrowths of a third, γ, polymorph. Lattice images of the β form, together with the diffraction data, are used to derive possible structures for these materials.

Boyd, M. E., Mountain, R. D., **Methods for determining the second virial coefficient of a gas from speed-of-sound data,** *Phys. Rev. A.* **2,** *No. 5, 2164–2167 (November 1970).*

Key words: Acoustic thermometry; equation of state; equilibrium gas properties; helium; second virial coefficient; speed of sound in gases.

Two methods of analyzing data on speed of sound in gases to obtain the second virial coefficient $B(T)$ are compared. The older method, which assumes a form for the temperature dependence of B, is shown to correspond to finding an exact solution to an approximate differential equation for B, while a method recently proposed by Bruch solves the exact equation, but in an approximate manner. Examination of the errors in each method indicates that the first method is preferable.

Brown, D. W., Lowry, R. E., Wall, L. A., **The radiation-induced polymerization of 3,3,4,4,5,5,5-heptafluoropentene-1 at high pressure,** *J. Poly. Sci.* **8,** *Part A-1, 3483–3493 (1970).*

Key words: 3,3,4,4,5,5,5 Heptafluoropentene-1; irradiation; polymerization; pressure.

A study was made of the radiation-induced polymerization under pressure of 3,3,4,4,5,5,5 heptafluoropentene-1. Polymerization rates increase with pressure (activation volume equals −11cc/mol) and temperature (activation enthalpy equals 6.5 kcal/mol) in liquid phase. At 13800 atm and 25 °C freezing occurs; the polymerization rate in the solid is very small. In liquid phase polymerization can continue for many hours after the irradiation is terminated. An active species is formed by radiation which initiates polymerization in the dark period.

Brown, R. L., **Diffusion of a trace gas into a flowing carrier,** *Intern. J. Chem. Kinetics* **2,** *475–477 (1970).*

Key words: Diffusion equation; diffusion of gases; flow reactor; gas mixing; mixing by diffusion; relaxation methods.

Numerical methods are used to solve the differential equation for diffusion of a trace gas into a flowing carrier gas having a parabolic velocity profile in a cylindrical tube. Steady state solutions are given in the form of contour diagrams of constant trace gas concentration.

Carter, G. C., Kahan, D. J., Bennett, L. H., Cuthill, J. R., Dobbyn, R. C., **The NBS alloy data center: permuted materials index,** *Nat. Bur. Stand. (U.S.), Spec. Publ. 324, 683 pages (Mar. 1971), $7.00, SD Catalog No. C13.10:324.*

Key words: Alloy data; bibliography; index; information; Knight shifts; NMR; soft x ray.

This Index contains literature references to ~10,000 research papers on physical properties of metals and alloys. The Index contains all NMR Knight shift papers and soft x-ray emission papers. It also contains many soft x-ray absorption papers and a number of papers on generally related topics such as susceptibilities, specific heats, hyperfine fields, and band structures. The papers are annotated in depth and the coded information put onto a magnetic tape. The Permuted Materials Index was created from this tape, listing alloys under each of their constituent components (i.e., CuNi appears under CuNi and under NiCu alloys).

Cezairliyan, A., **High-speed methods of measuring thermophysical properties at high temperatures** *(Proc. Conf. Thermophysical Properties, Manchester, England, April 7–10, 1970), Rev. Inst. Hautes Temper. Refract* **T.7,** *215–229 (1970).*

Key words: High-speed measurement methods; high temperatures; thermodynamics; thermophysical properties.

In this paper, "high-speed" refers to experiments which are of subsecond duration. However, in some cases quasi-dynamic experiments with durations greater than one second are also included. Advantages of high-speed measurement of thermophysical properties of substances at high temperatures (above 2000 K) are presented. Requirements of high-speed measurements are given. Methods used for the generation and measurement of thermal energy in short times are described. Various techniques (photoelectric, photographic, and others) used for the measurement of the temperature of rapidly heating or cooling specimen are presented. Techniques for high-speed recording of quantities are described. Particular attention is given to millisecond-resolution digital data acquisition systems. Application of the high-speed techniques to the measurement of specific heat, electrical resistivity, thermal radiation properties, melting point, thermal diffusivity and others are described. Accuracy of high-speed measurements are discussed and are compared with those of conventional methods. Potential applications of high-speed methods are presented.

Chamberlain, G. E., Mielczarek, S. R., Kuyatt, C. E., **Absolute measurement of differential cross sections for electron scattering in helium,** *Phys. Rev.* **A2,** *No. 5, 1905–1922 (November 1970).*

Key words: Absolute differential cross section; Born; elastic; electron impact; helium; inelastic.

Absolute measurements of cross sections for electron-impact scattering in helium at 5° angle have been made for elastic scattering and excitation of the 2^1P and 2^1S states and for incident energies of 50–400 eV. Cross section values of $\sigma(2^1P, 5°)$ are found to be lower than theoretical Born values by 10% at 400 eV, 30% at 100 eV, and 60% at 50 eV. Deduced values of total 2^1P excitation cross sections ($E \geq 100$ eV) are in agreement with other experimental values. Our measurements for elastic scattering agree well with recent theoretical calculations.

Chandler, H. H., Rupp, N. W., Paffenbarger, G. C., **Poor mercury hygiene from ultrasonic amalgam condensation,** *J. Am. Dental. Assoc.* **82,** *553–557 (March 1971).*

Key words: Amalgam condensation; mercury; mercury vapor levels; threshold limit.

There is a potential hazard of mercury poisoning in using an ultrasonic device for amalgam condensation. A cloud of mercury droplets and alloy particles was emitted from the soft amalgam at the working tip of the instrument. Mercury vapor levels as recorded by a vapor detector held 12 inches from the working tip were 20% of the allowable threshold limit value (0.1 mg Hg/m^3 of air) and probably do not represent unsafe levels. The continued long-time use of the ultrasonic instrument would result in the deposition of a great many mercury droplets throughout a dental operatory and could thereby cause higher mercury vapor levels especially in poorly ventilated spaces. In addition, the inhalation of the emitted material by the patient and the dental health personnel cannot be considered good hygiene. Therefore, the use of this instrument for amalgam condensation is contra-indicated until such time as the safety of the instrument for this purpose is firmly established.

Czyz, W., Maximon, L. C., **Coulomb effects in high energy He^4–He^4 elastic scattering,** *Ann. Phys.* **60,** *No. 2, 484–486 (October 1970).*

Key words: Diffraction scattering; Glauber model; high energy Coulomb effects; high energy scattering; He^4–He^4 elastic scattering.

In this note we extend the results of a previous work for high energy He^4–He^4 elastic scattering to include the Coulomb corrections. We find these corrections important around the diffractive minima.

Dibeler, V. H., Walker, J. A., McCulloh, K. E., **Photoionization study of chlorine monofluoride and the dissociation energy of fluorine,** *J. Chem. Phys.* **53,** *No. 12, 4414–4417 (December 15, 1970).*

Key words: Chlorine monofluoride; dissociation energy; ionization energy; mass spectrometry; photoionization; vacuum ultraviolet.

Mass spectra and photoionization yield curves are obtained for the molecular and atomic ions of chlorine monofluoride. The atomic ions are formed both by ion-pair and by dissociative ionization processes, although the F^+ ion formed by the latter process is too weak for quantitative measurements. The ClF^+ curve exhibits a weak onset at 12.55 eV, ascribed to a hot band. An intense onset at 12.65 eV is ascribed to the (0, 0) transition. The observed thresholds for the Cl^+ ion support the spectroscopic determination of $D(ClF)=2.558$ eV and, along with a recent determination of the heat of formation of ClF, support the previously reported photoionization value of $D_0^\circ(F_2)=1.34$ eV.

Dillon, T. A., Smith, E. W., Cooper, J., Mizushima, M., **Semiclassical treatment of strong collisions in pressure broadening,** *Phys. Rev. A* **2,** *No. 5, 1839–1846 (November 1970).*

Key words: Classical path approximation; intermolecular potential; pressure broadening; strong collisions.

The classical path approximation reduces the problem of pressure broadening of spectral lines to the evaluation of matrix elements of the scattering operator. If the intermolecular potential is long range and the interaction volume is large the broadening is caused by distant or weak collisions. In this case the scattering operator can be approximated by a second order expansion and the perturber trajectories can be taken to be straight paths. For neutral atoms or molecules the intermolecular potential is short range and broadening arises from close or "strong" collisions. In this paper it is shown how classical trajectories, determined by a "monopole" interaction (i.e., one that does not depend upon the state of the radiator) can be used to expand the scattering operator in a sum of operators characteristic of the radiator's internal states.

Ederer, D. L., Lucatorto, T., Madden, R. P., **Autoionization spectra of lithium,** *Phys. Rev. Letters* **25,** *No. 22, 1537–1540 (November 30, 1970).*

Key words: Absorption spectroscopy; autoionization configuration interaction; *K* electron excitation; lithium vapor and two electron excitation.

Resonances have been observed in neutral lithium vapor by absorption spectroscopy for photons in the 50–70 eV energy range. These resonances are due to the excitation of a *K*-shell electron, or the simultaneous excitation of a *K*-shell electron and an outer electron to final states of the type ($1s2pnl$) or ($1snln'l'$). Several well-developed series have been observed as well as resonances where energy position and intensity are perturbed by neighboring configurations.

Edqvist, O., Lindholm, E., Selin, L. E., Asbrink, L., Kuyatt, C. E., Mielczarek, S. R., Simpson, J. A., Fischer-Hjalmars, I., **Rydberg series of small molecules VIII photoelectron spectroscopy and electron spectroscopy of NO_2,** *Phys. Scrip.* **1,** *172–178 (1970).*

Key words: Electron spectroscopy; NO_2; photoelectron spectroscopy; Rydberg series.

The photoelectron spectrum of NO_2 has been measured with high resolution up to 27.5 eV and interpreted by use of molecular orbital theory, taking especially the vibrational structure into account. The electron impact energy loss spectrum has been measured with electron energy 100 eV. The spectrum above 6.5 eV has been interpreted as due to Rydberg transitions and comparison with spectroscopic measurements have been made.

Gadzuk, J. W., **A comparison between the Fermi-Thomas and quantum dielectric response of a metal surface to a static point charge,** *Surface Sci.* **23,** *58–68 (1970).*

Key words: Adsorption; electron gas; impurities; surface physics.

Recently published theoretical treatments of the screening of a point charge in the surface region of a bounded electron gas are considered. The Fermi-Thomas semi-classical electrostatic screening theory of Newns is compared with the quantum screening theory of the present author. Simple formulae for dipole moments and binding energies are given. The results are essentially equivalent for the two cases aside from numerical factors which are manifestations of the fact that Fermi-Thomas screening is too efficient.

Geltman, S., Burke, P. G., **Electron scattering by atomic hydrogen using a pseudo-state expansion II. Excitation of 2*s* and 2*p* states near threshold,** *J. Phys. B: Atom. Molec. Phys.* **3,** *No. 8, 1062–1072 (August 1970).*

Key words: Close coupling calculation; electron scattering; pseudo-state expansion.

The pseudo-state modification of the close-coupling expansion is applied to the $2s$ and $2p$ excitation of atomic hydrogen by electron impact. Pseudo-states are used which ensure the implicit inclusion of all important excited state polarizabilities. A detailed comparison is made with results obtained from other modifications of the close-coupling expansion and the eigenphase minimum principle is used to determine the best result for each partial cross section. Comparison of the theory and experiment in the first electron volt above the $n=2$ threshold shows very good agreement in the ratio $Q(1s-2s)/Q(1s-2p)$, but a 20% discrepancy exists between the individual cross section magnitudes when experiment is normalized to the Born approximation at higher energies.

Hahn, T. A., **Thermal expansion of copper from 20 to 800 K—Standard reference material 736,** *J. Appl. Phys.* **41,** *No. 13, 5096–5101 (December 1970).*

Key words: Components of error (within and between samples); copper; interferometer; standard reference material; thermal expansion.

Copper is the first of a series of materials that will be certified as thermal expansion standards by the National Bureau of Standards. The results of tests on five specimens indicate the stock is of consistent quality so that it may be certified as Standard Reference Material 736. A Fizeau interferometer was used for the expansion measurements. Above room temperature a controlled atmosphere furnace using a calibrated Pt vs. Pt–10% Rh thermocouple was used. Below room temperature a cryostat capable of operation with both liquid nitrogen and helium was used with a calibrated platinum resistance thermometer. Values of expansivity were calculated between equilibrium temperatures. The expansivity was used in the analysis of the data. Third order polynomials were fit to the data for each of the five specimens in the overlapping temperature ranges from 0 to 70 K, 50 to 270 K, and 210 to 800 K to test for variations between the specimens. The deviations between the five equations were well within the standard deviations of the data for each of the specimens in the respective temperature intervals. All the expansivity data was then pooled and used to obtain an equation for each of the temperature ranges given above. These equations and their integrals were used to calculate the final values of expansivity and expansion respectively. The results of the statistical analysis of the expansion and expansivity data is presented. A comparison is made with the data in the literature.

Hamer, W. J., **Standard cells, the primary battery, 1,** *No. 12, 433–477,* George W. Heise and N. Corey Cahoon, Eds. *(John Wiley & Sons, Inc., New York, N.Y., January 1971).*

Key words: Electromotive force; saturated standard cells; standard cells; unsaturated standard cells.

This paper gives a survey of saturated and unsaturated standard cells including descriptions of their construction and their behavior under diversified conditions. The survey also includes a discussion of the role standard cells play in the maintenance of the unit of electromotive force. A discussion of the Hulett standard battery is also included.

Harris, F. K., Fowler, H. A., Olsen, P. T., **Accurate Hamon-pair potentiometer for Josephson frequency-to-voltage measments,** *Metrologia* **6,** *No. 4, 134–142 (October 1970).*

Key words: Frequency-to-voltage ratio; Josephson effect; potentiometer; voltage standard.

Accuracy and precision of parts in 10^7 have been demonstrated in a potentiometer which compares two- to ten-millivolt dc signals from Josephson junctions against the U.S. "legal volt" secondary standard cells. The circuit comprises two (10×100 ohm) Hamon boxes in series-to-parallel interchange, linked by a calibrated Kelvin-Varley current divider. The critical Hamon-circuit contacts are all made through mercury-wetted amalgams; the entire circuit operates in smoothly stirred oil. Observations indicate the pair of Hamon boxes to be initially balanced within 0.2 ppm at the operating temperature. Typical standard deviation in the day-to-day, run-to-run scatter of Josephson frequency-to-voltage ratio, measured with this instrument, is 0.3 ppm or less. Preliminary values for the observed ratio are in general accord with the quoted values of Parker et al., Petley and Morris, and Finnegan et al.

Harvey, J. L., Milliken, L. T., Forthofer, R. J., **Trends in motor vehicle brake fluids and their standards,** *Proc. Society of Automotive Engineering Conf., Paper No. 710253, pp. 1–17 (January 11–15, 1971).*

Key words: Brake fluids; brake fluid standards; motor vehicle brake fluid; passenger car braking systems.

The development of motor vehicle brake fluids (MVBF's) and of their specification requirements is reviewed and discussed with emphasis on the major problems encountered in service. Those factors held to be of major importance in establishing performance requirements for MVBF's are considered also, and applied to the major changes that have recently been proposed for revision of Federal Motor Vehicle Safety Standard No. 116. The needs and possibilities for further revision in the MVBF safety standard are examined. Finally, potential effects of some current trends in the design of passenger car braking systems are considered.

Hellwig, H., **Areas of promise for the development of future primary frequency standards,** *Proc. 24th Annual Symp. on Frequency Control, Atlantic City, N.J., April 27–29, 1970, pp. 246–258 (Electronic Industries Assn., Washington, D.C., 1970); Metrologia* **6,** *No. 4, 118–126 (October 1970).*

Key words: Accurate frequency standards; accurate length standards; accurate time standards; accurate voltage standards; ion storage; laser stabilization; maser oscillator; metrology; quantum electronics; saturated absorption; slave oscillators.

In this paper possibilities are discussed which may lead to the development of future primary frequency standards of superior accuracy capability. A review is given of the various methods and techniques which are currently employed in quantum electronic frequency standards or which have a potential usefulness. Various effects which influence the output frequency of a primary standard are associated with these methods. A classification is given: (a) Effects associated with the interrogation of particles (atoms or molecules); (b) effects related to the method of confining the particles; and (c) effects associated with the particles themselves and the way in which they are treated for an effective interrogation by electromagnetic radiation. These three classes of effects are discussed in detail, and expectation values for the related uncertainties are given. For selected particles certain methods of interrogation, confinement, and particle preparation can be combined such as to minimize the net uncertainty due to all applicable effects. Different technical solutions are the result. A review of existing and proposed devices is given, including quantitative data on the stability and accuracy capability. Aspects of the most promising devices are discussed, and it is concluded that accuracy capabilities of 10^{-14} should be within reach of today's research and development.

Hellwig, H., Vessot, R. F. C., Levine, M. W., Zitzewitz, P. W., Allan, D. W., Glaze, D. J., **Measurement of the unperturbed hydrogen hyperfine transition frequency,** *IEEE Trans. Instr. Meas.* **IM–19,** *No. 4, 200–209 (November 1970).*

Key words: Atomic frequency standard; atomic time; cavity tuning; frequency accuracy; frequency shift; frequency stability; hydrogen hyperfine transition; hydrogen maser; hydrogen storage; hydrogen wall collisions; NBS–III; teflon; universal time.

We report the results of a joint experiment which was aimed primarily at the determination of the frequency of the H^1 hyperfine transition ($F=1$, $m_F=0$) $\leftrightarrow$ ($F=0$, $m_F=0$). In terms of the frequency of the Cs^{133} hyperfine transition ($F=4$, $m_F=0$) $\leftrightarrow$ ($F=3$, $m_F=0$), defined as 9192 631 770 Hz, we obtain for the unperturbed hydrogen transition frequency the value $\nu_H = 1420\ 405\ 751.768$ Hz. This result is the mean of two independent evaluations which differ by 2×10^{-3} Hz. We estimate the one sigma uncertainty of the value ν_H to be also 2×10^{-3} Hz. One evaluation is based on the wall shift experiments at Harvard University [1]; the other is a result of a new wall shift measurement using many storage bulbs of different sizes at the National Bureau of Standards. We describe the experimental procedures and the applied corrections. We compare our results for the wall shift and for the frequency of hydrogen with previously published values and discuss the error limits or our experiments.

Hicho, G. E., Yakowitz, H., Rasberry, S. D., Michaelis, R. E., **Standard reference materials: A standard reference material containing, nominally four percent austenite,** *Nat. Bur. Stand. (U.S.), Spec. Publ. 260–25, 22 pages (Feb. 1971) 30 cents, SD Catalog No. C13.10:260–25.*

Key words: Austenite in ferrite; electron microprobe; powder metallurgy; quantitative microscopy; SRM; x-ray fluorescence analysis.

This standard was produced by powder metallurgical techniques using known amounts of austenite. Using these techniques, 134 specimens were prepared. Because these standards are expected to be used primarily for the calibration of x-ray diffraction equipment, only one surface of each standard is certified, and these surfaces range from 3.1 percent to 5.2 percent in austenite content. To make the specimens, 310 stainless steel powder (austenitic) was blended with 430 stainless steel powder (ferritic) to make a mixture of 5 percent austenite in ferrite. The material was compacted, sintered, polished and etched so the austenite appears white and the ferrite, a deep brown. Then quantitative microscopy methods were used to determine the percentage of austenite near the surface. Furthermore, the 310 powder contains 20 percent of nickel while the 430 powder contains virtually no nickel. Therefore, after establishing a meaningful calibration curve, x-ray fluorescence analysis for the nickel content was also used as a direct measurement of the amount of austenite on the surface of the compact. Both procedures were carried out on fifteen specimens statistically selected from the total number of compacts produced. Agreement, within experimental error limits, was obtained between the x-ray fluorescence results and quantitative microscopy results. The x-ray fluorescence method was used to characterize all additional compacts. X-ray diffraction determinations of austenite content are in good agreement with the x-ray fluorescence and quantitative microscopy results. The compacts may be used as x-ray diffraction standards for austenite or in special cases as x-ray fluorescence standards for nickel content.

Hord, J., Voth, R. O., **Tabulated values of cavitation *B*-factor for helium, H_2, N_2, F_2, O_2, refrigerant 114, and H_2O,** *Nat. Bur. Stand. (U.S.), Tech. Note 397, 116 pages (Feb. 1971) $1.00, SD Catalog No. C13.46:397.*

Key words: Cavitation; cryogenics; pumps.

A brief history is given on the development of the *B*-factor concept and its application to the design of liquid pumps. Adaptation of the "quasi-static" vaporization model to the cavitation process is discussed; previous methods of computing *B*-factor are reviewed and a simplified, more precise computation, consistent with the "quasi-static" model, is established. Merits of the different computational techniques are discussed and two of the methods are graphically compared. The best available property data are used to compute *B*-factors for several fluids over a wide range of temperatures. The results are tabulated as reference data; they are useful in the application of the *B*-factor concept to the prediction of performance in cavitating liquid pumps.

Ives, L. K., Ruff, A. W., Jr., **Extended dislocation configurations in HCP silver-tin alloys of low stacking-fault energy,** *Metal Sci. J.* **4**, *201–209 (May 1970).*

Key words: Dislocation multipoles; dislocation networks; dislocation nodes; dislocations; electron microscopy; hexagonal alloys; silver-tin alloys.

Configurations resulting from the interaction of extended dislocations in low stacking fault energy hcp silver-tin alloys are studied by means of transmission electron microscopy. The interactions of all possible sets of two different extended dislocations are considered. Since there are two different modes by which dislocations extend in the hcp structure, these interactions fall into two classes: Class I interactions occur between two dislocations extended in the same way, and Class II interactions involve two dislocations extended in different ways. The resulting configurations consist of several different kinds of nodes, node pairs, double ribbons, and dipoles. Interactions between arrays of extended dislocations lead to the formation of networks of these configurations and to multipoles. Many of the observed configurations are similar to those reported in hexagonal graphite. The Class I configurations are similar to those found in low stacking fault energy fcc metals.

Jacox, M. E., Milligan, D. E., **Infrared spectrum and structure of the species CO_3,** *J. Chem. Phys.* **54**, *No. 3, 919–926 (February 1, 1971).*

Key words: CO_2; CO_3; force constants; infrared spectrum; matrix isolation; O-atom reaction; structure; ultraviolet spectrum; vacuum-ultraviolet photolysis.

Upon photolysis of solid CO_2 by 1216–Å radiation, very high yields of CO_3 have been obtained. There is no evidence for the production of hydrogen-containing species in experiments in which photolytically produced H or D atoms are also present. Experimental evidence supports a C_{2v} structure for CO_3 in its ground state, as predicted by molecular orbital calculations. The vibrational frequency pattern for the planar modes of isotopically substituted species of CO_3 has been fitted to a valence force potential having a minimal number of interaction force constants, assuming both an open structure having an O–C–O angle of 80° and a three-membered ring structure having an O–C–O angle of 65°. Although the force constants obtained for the ring structure appear to be quite reasonable, exceptionally large values have been obtained for the O–C–O bending force constant and for all of the interaction constants for the open structure. On this basis, the three-membered ring structure is favored for CO_3 in its ground state.

Jennings, D. A., **Power and energy measurement of repetitively pulsed lasers,** *Nat. Bur. Stand. (U.S.), Tech. Note 398, 10 pages (March 1971) 25 cents, SD Catalog No. C13.46:398.*

Key words: Average power; energy per pulse; laser; peak power; repetitively pulsed lasers.

The problem of measuring average power, energy per pulse, and peak power of some of the more common repetitively pulsed lasers is discussed. The techniques which have been used at the National Bureau of Standards are mentioned along with some of the accuracies obtained. Accuracies of 3 to 10 percent can be achieved, depending on the laser source and the parameter of interest.

Kelley, R. D., Klein, R., Scheer, M. D., **Isotope effects in the hydrogen-atom addition to olefins at low temperatures,** *J. Phys. Chem.* **74**, *No. 25, 4301–4309 (1970).*

Key words: Atom addition; hydrogen isotopes; low temperatures; olefins; orientation; quantum tunneling.

The ration of rates of addition of atomic hydrogen to the two possible sites of the double bond for several olefins has been measured over the temperature range 63–143K. A pronounced isotope effect was found. In the comparison of addition ratios at a given temperature, the data show that the isotope effect is related to the value of the addition ratio, large ratios showing relatively large effects. The ratio of terminal to non-terminal addition of H to propylene at 90K is 106, while for D it is 337. The ratio of H addition to carbon–2 relative to carbon–3 in *cis*-2-pentene at 90 K is 1.5 and that of D is the same. The results of these findings are discussed in terms of a one and two barrier model for the reaction of H with the olefinic bond. Both zero point energy effects and quantum tunneling of H through the reaction barriers are considered. It is concluded that a two barrier model with tunneling is most appropriate. The data generated from the H atom-olefin addition reactions in the low temperature region strongly support the existence of chemical quantum tunneling. This is effected without resort to the more equivocal arguments based on curvature of Arrhenius plots although indeed such curvature is found in the low temperature H atom additions.

Kuriyama, M., Miyakawa, T., **Primary and secondary extinctions in the dynamical theory for an imperfect crystal,** *Acta Cryst.* **A26**, *Part 6, 667–673 (November 1970).*

Key words: Dynamical diffraction; imperfections; kinematical scattering; piezoelectric vibration; secondary extinction; theory; X-ray diffraction.

Primary and secondary extinction are studied using the dynamical theory of x-rays diffracted by imperfect crystals. The transition from dynamical to kinematical scattering is explained in terms of fundamental processes in diffraction. Contrary to existing extinction theories, where the intensities diffracted dynamically by single coherent domains of a mosaic are combined using an *ad hoc* assumption of mosaic distributions, the present theory permits the dynamical *amplitudes* to change in response to disturbances of the dynamical interactions by imperfections. Neither the mosaic block model nor the statistical treatment of imperfections is used. The extinction of diffracted intensities is thereby treated as caused solely by *inhomogeneous* strains in a single coherent domain.

Kurylo, M. J., Peterson, N. C., Braun, W., **Absolute rate of the reaction H + H_2S,** *J. Chem. Phys.* **54,** *No. 3, 943–946 (February 1, 1971).*

Key words: Activation energy; H atoms; H_2S; rate constant; resonance fluorescence; vacuum-uv.

Flash photolysis coupled with resonance fluorescence of Lyman α radiation at 121.6 nm has been used to investigate the rate of reaction of H atoms with H_2S over the temperature range 190–464° K. Conditions were chosen under which atom-radical and radical-radical reactions were unimportant and only the H atom H_2S reaction occurred. The rate constant thus obtained can be expressed as $k_1 = (1.29 \pm 0.15) \times 10^{-11}$ exp $[-(1709 \pm 60)/1.987T]$, cm^3 $molecule^{-1}s^{-1}$. Comparison of the Arrhenius A factor with that predicted by entropy considerations suggests a somewhat loose activated complex, but not as loose as expected on the basis of the exothermicity of the H + H_2S reaction.

Lamb, V. A., Johnson, C. E., Valentine, D. R., **Physical and mechanical properties of electrodeposited copper, III. Deposits from sulfate, fluoborate, pyrophosphate, cyanide, and amine baths,** *J. Electrochem. Soc.* **117,** *No.'s 9, 10, 11, 291C–318C, 341C–352C, 381C–404C (Sept., Oct., Nov. 1970).*

Key words: Annealing-electrolylic copper; electrodeposited copper; impurity content; properties of mechanical structure.

This paper is the third published report on the results of a broad program on properties of electrodeposited copper, sponsored jointly by the American Electroplaters' Society, The International Copper Research Association, Inc., The Copper Development Association, and the National Bureau of Standards. The first paper is a comprehensive review of the literature to 1965. The second paper is an interim report on experimental results. The present and final paper, which incorporates the data in the second, includes data from the baths designated in the title, for deposits prepared under a wide range of operating conditions and with use of a variety of addition agents. Properties measured include tensile strength, yield strength, elongation, modulus of elasticity, fatigue limit, hardness, internal stress, density, electrical resistivity, and thermal expansivity. Properties were measured for as-plated deposits, deposits after annealing at several temperatures, after cold-working, and at low and high ambient temperatures. Structure of deposits was examined by optical, electron micrograph, and x-ray methods. Content of impurities in deposits was determined. Correlations are developed among properties, structure, impurity content, type of bath, and operating conditions.

Larsen, N. T., Clague, F. R., **The NBS type II power measurement system,** *Proc. 25th Annual 1970 Instrument Society of American Conf. and Exhibit, Philadelphia, Pa., October 26–29, 1970, 11 pages.*

Key words: Bridge; leveler; microwave; power; self balancing; stabilizer.

The design, construction, and performance of a new solid state microwave power measuring system are described. The instrument consists of two modules—a self-balancing bolometer bridge and a reference generator. The reference generator is a multi-function module which may be used as either a 0.01 percent differential voltmeter with a 0 to 10 volt range, a 0 to 10 reference voltage source of 0.01 percent absolute accuracy, or a precision microwave power leveler. A six decade divider provides high precision in all three functions.

Latanision, R. M., Ruff, A. W., **The temperature dependence of stacking fault energy in Fe-Cr-Ni alloys,** *Met. Trans.* **2,** *505–509 (February 1971).*

Key words: Dislocations; electron microscopy; iron alloys; stacking fault energy; temperature.

The variation of intrinsic stacking fault energy (γ_i) in two austenitic Fe-Cr-Ni alloys has been determined from dislocation node measurements over the range 25 to 325 °C by means of high temperature transmission electron microscopy. In both alloys γ_i increases with temperature. Both reversible and irreversible effects have been observed in cyclic heating-cooling experiments. After the first heating to elevated temperature the irreversible component is removed and thereafter cyclic annealing produces essentially reversible changes in γ_i. The large reversible changes are best understood in terms of the variation in the stability of austenite with temperature. The smaller irreversible effect appears to arise from the formation of substitutional solute atmospheres around partial dislocations at elevated temperature.

Linsky, J. L., Avrett, E. H., **The solar H and K lines,** *Astron. Soc. Pacific* **82,** *169–248 (April 1970).*

Key words: Ca H and K lines; non-LTE line formation; plages; radiative transport; solar chromosphere; solar spectrum; sunspots; Wilson-Bappu effect.

We review our current understanding of the formation of the Ca II H and K resonance and infrared triplet subordinate lines in the sun in view of the wealth of observations of these lines and the development of non-LTE line formation theory. We describe the low and high spatial resolution data of these lines on the solar disk, off the limb, and in stellar spectra. We also describe observations of the analogous Mg II resonance lines.
We review the various explanations proposed for the observed features of the lines including the double reversal, limb darkening, plage and spot profiles, and the anomalous line ratios. Line profiles are computed according to a first-order steady-state theory in which we assume a one-component atmosphere in hydrostatic equilibrium, noncoherent scattering, and a fine-level atom and continuum representation for Ca II. The chromospheric model chosen is meant to be representative rather than definitive, but it produces profiles of all fine lines and a microwave continuum in agreement with observations at the center of the disk. We then discuss extensions of this first order theory.

Liu, Y. M., Coleman, J. A., **Electron radiation damage effects in silicon surface-barrier detectors,** *IEEE Trans. Nucl. Sci.* **NS–18,** *No. 1, 192–199 (February 1971).*

Key words: Alpha particles counting response; capacitance; detector noise; electron fluence; electrons radiation damage; front and rear contact; leakage current; silicon surface-barrier detector.

Silicon surface-barrier detectors have been irradiated at room temperature with monoenergetic electrons in the energy range of 200 keV to 1 MeV. The changes of detector reverse leakage current, noise, capacitance and alpha-particle counting response were determined. In general, detector current and noise increased with electron fluence and energy for electron energies of 400 keV and above. Detector capacitances tended to decrease slightly for electron fluences up to 10^{13} cm^{-2} and increase at higher fluences. No significant degradation of detector performance was observed as a result of irradiation with 200-keV electrons for fluences up to $10^{16}/cm^2$. The effects of damage on detector performance were reduced when the rear, aluminum contact was irradiated rather than the front, gold contact.

Madey, T. E., Yates, J. T., Jr., **Electron-stimulated desorption and work function studies of clean and cesiated (110) GaAs,** *J. Vacuum Sci. Technol.* **8,** *No. 1, 39–44 January–February 1971.*

Key words: Adsorption; cesium; desorption; electron reflection; electron stimulated desorption; gallium arsenide; work function.

The surface of a degenerate p-type GaAs crystal, cleaved in ultrahigh vacuum to expose the (110) plane, has been examined as a function of cesium coverage using several methods. Electron stimulated desorption (ESD) of ions upon bombardment of the surface by 100 eV electrons is found to be extremely sensitive to trace quantities of adsorbed impurities. The work function-coverage relation for Cs^+ deposited from a Cs zeolite ion gun was determined using a retarding potential method; the energy dependence of electron reflection in the range 0 to 10 eV was found to differ markedly between the clean and cesiated surfaces.

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Maki, A. G., Olson, W. B., Sams, R. L., **HCN rotational-vibrational energy levels and intensity anomalies determined from infrared measurements,** *J. Mol. Spectry.* **36,** *No. 3, 433–447 (December 1970).*

Key words: Absorption; energy levels; gas laser; HCN, hydrogen cyanide; infrared; rotational constants; spectra; vibrational constants.

New measurements have been made on the infrared transitions 11^10–000, 04^00–000, 12^00–01^10, 12^20–01^10, 05^10–01^10, 13^30–02^20, 12^20–000, and 20^00–000 for HCN and on the 11^10–000 transitions for both $H^{13}C^{14}N$ and $H^{12}C^{15}N$. Wherever possible those measurements were combined with laser measurements in order to obtain the best set of constants for describing the energy levels. Unusual intensity distributions were observed and explained as due to intensity mixing through l-type resonance. The relative intensities of the Δ–Σ (12^20–000) and Σ–Σ (12^00–000) transitions were also measured and explained in the same way.

Mandel, J., **A new analysis of variance model for non-additive data,** *Technometrics* **13,** *No. 1, 1–18 (February 1971).*

Key words: Factorial experiments; interaction; non-additivity; principal components; surface fitting; two-way arrays.

A method is presented for the analysis of data representing functions of two variables, when the response can be tabulated in a rectangular array. The procedure is based on a partitioning of the row by column interaction effects into a sum of terms, each of which is the product of a row factor by a column factor. The factors in each term are estimated by a method involving the extraction of characteristic roots.
The method contains as special cases a number of procedures used for the handling of non-additivity in two-way arrays. It is very useful for the fitting of empirical surfaces, but is also applicable to cases in which the data depend on qualitative rather than quantitative factors. Comparisons with other techniques are made and an illustrative example is given.

Marsden, C. P., Editor, **Silicon device processing,** *Proceedings of a Symposium held at Gaithersburg, Maryland, June 2–3, 1970, Nat. Bur. Stand. (U.S.), Spec. Publ. 337, 467 pages (Nov. 1970) $5.50, SD Catalog No. C13.10:337.*

Key words: Analysis; device processing; diffusion; epitaxy; junctions; resistivity; surface preparation.

This Symposium covered the measurement field and was purposefully restricted to the generic topics of diffusion, epitaxy, surface preparation and interdependence of unit processing operations. This emphasis on measurement during the processing operation or on the characteristics of the processed material, showed the necessity and more important, the ambiguities of current methods of measurement. The application of some new techniques to measurement were also discussed.

Marshak, H., Dove, R. B., **A right angle ^{3}He cryostat incorporating a high field superconducting solenoid,** *Nat. Bur. Stand. (U.S.), Tech. Note. 562, 22 pages (Dec. 1970) 30 cents, SD Catalog No. C13.46:562.*

Key words: ^{3}He cryostat; ^{3}He refrigerator; nuclear orientation; superconducting solenoid.

Construction and operation of a novel ^{3}He cryostat, incorporating a large superconducting solenoid mounted at right angles to the cryostat's vertical axis, is described. This new cryostat which is part of the transportable National Bureau of Standards ^{3}He refrigerator, has been used successfully for nuclear orientation studies at the Atomic Energy Research Establishment, Harwell, England.

Martin, J. F., **Standard Reference Materials: National Bureau of Standards-U.S. Steel corporation joint program for determining oxygen and nitrogen in steel,** *Nat. Bur. Stand. (U.S.), Spec. Publ. 260–26, 40 pages (February 1971) 50 cents, SD Catalog No. C13.10:260–26.*

Key words: Inert gas fusion; one ppm of oxygen and nitrogen in steel; Research associate program; simultaneous determination of oxygen and nitrogen; Standard Reference Material for oxygen.

Because of a need for a method for the rapid, simultaneous determination of small concentrations of oxygen and nitrogen in steel, a joint project under the Industrial Fellowship Program of U.S. Steel and the Research Associate Program of the National Bureau of Standards (NBS) was established. After investigation of various techniques, and analytical apparatus was constructed with excellent sensitivity for both elements. This apparatus consists of an inert gas fusion system coupled to a gas chromatograph. Recommended modifications have been completed on this equipment, and simultaneous determinations of oxygen and nitrogen in steel are presently being made. The detection limit is < 1 ppm for both oxygen and nitrogen, and the analysis time is about 5 minutes.
A direct result of this program has been the issuance by NBS of a new Standard Reference Material (SRM), a maraging steel, for oxygen. This SRM has the lowest oxygen concentration (4.5 ppm) of any steel standard yet issued by NBS.

Meinke, W. W., **The universal analytical instrument,** *Proc. 5th Annual National Conference on Industrial Research, Applying Emerging Technologies, Industrial Research, Inc., Chicago, Ill., September 18, 1969, pp. 31–41 (1970).*

Key words: Automated analysis; clinical chemistry; instrumentation; Standard Reference Materials.

The Fifth Annual National Conference on Industrial Research focused attention on the "Application of Emerging Technologies." As part of a panel discussion on "Instrumentation Applications," the author was asked to discuss "The Universal Analytical Instrument." This topic has been interpreted as applying to the overall field of automated laboratory instrumentation.
A summary was given of the experience in automation of the NBS Analytical Chemistry Division consisting of nine sections and approximately sixty different analytical competences. Several specific areas, such as clinical chemistry, where standardized instrumentation has not kept pace with the needs were discussed. Automation in optimum operation should free a scientist for the important and essential decision-making process rather than replacing him entirely. Furthermore, when automated systems become the rule rather than the exception, it is absolutely essential that there be some kind of standardization (often using Standard Reference Materials) built into the system so that one can get a measurement that really means something. Finally, there is a need for finding new ideas for automation rather than extending old ones.

Menis, O., Editor, **Status of thermal analysis,** *Proceedings of a Symposium on the Current Status of Thermal Analysis Held at Gaithersburg, Maryland, April 21–22, 1970, Nat. Bur. Stand. (U.S.), Spec. Publ. 338, 189 pages (Oct. 1970) $1.00, SD Catalog No. C13.10:338.*

Key words: Atherosclerotic plaque; DSC; elastomers and vulcanizates; explosives; high temperature DTA; kinetics by TGA; selection of DTA parameters; temperature standards; TGA; theory of isoperibol and adiabatic shield calorimeters.

The symposium papers offer contributions in differential thermal analysis (DTA), differential scanning calorimetry (DSC), development of standards for DTA temperature scales, and applications in high temperature biochemical, polymer and explosive materials. The selection and the effect of experimental parameters on the types of information on thermal curves is described. The measurement theory of isoperibol and adiabatic shield calorimeters by the method of intermittent heating is described and the magnitude of calorimetric instrumental errors is outlined. In an analysis of a differential scanning calorimeter, three instrumental time constants are described and the necessary corrections for the various instrumental and thermal time constants are recommended. The need for and the status of temperature scale standards for DTA is discussed. An evaluation of 12 materials for use as standards by cooperating laboratories is presented. High temperature (> 1900 K) DTA, problems of high temperature calorimetry to 1300 K are discussed. The implications concerning the nature of biological membranes and decomposi-

tion of atherosclerotic plaques are derived from differential scanning calorimetry of three-component systems of phospholipid, cholesterol or one of its esters and water.
A description is given of an apparatus developed for measuring the rate at which vapors are evolved during the thermal degradation of material in a modified thermogravimetric apparatus. The modifications of a DTA cell to minimize explosions is described. Data derived from the use of lead azide was used to evaluate the technique. Thermogravimetric analysis for establishing basic composition of elastomer compounds and vulcanizates were reviewed. A careful study of oxidation characteristics of carbon black in the formulation is also included.

Menis, O., McClellan, B. E., Bright, D. S., **Determination of the formation constants of iron (III) and vanadium (V) with β-isopropylortropolone using the extraction method,** *Anal. Chem.* **43,** *No. 3, 431–435 (March 1971).*

Key words: Chelate; equilibrium constants; extraction method; ferric; graphical; β-isopropyltropolone; least square computer calculations; vanadyl.

Equilibrium constants of ferric and vanadyl ions for the formation of the chelate with β-isopropyltropolone (HIPT) were determined by the extraction method. The values for these constants were derived by graphic and least squares computer calculations. The constants for the vanadyl system are reported for the first time. It is postulated that an adduct $VO_2IPT \cdot HIPT$ is formed and its formation constant, log $\beta_N = K_1K'$, was determined as 13.8 and 13.6±0.8 by graphical and least squares calculations respectively. The partition constant, K_{DC}, was 2.5 and 2.6±0.4 respectively. The values for $Fe(IPT)_3$ complex were for log β_N, 37.7 and 37.8±0.1 respectively, while the log K_{DC} was 2 and 2.0±0.1 respectively. It was also possible to calculate the overall stepwise constants, log $\beta_1 = 13.0 \pm 0.2$ and log $K_2K_3\beta_2 = 24.8 \pm 0.1$ by the least squares method. The other experimental parameters which were studied were the effect of solvent and ionic strength.

Menis, O., Rains, T. C., **Sensitivity, detection limit, precision and accuracy in flame emission and atomic absorption spectrometry, Chapter 2, Analytical Flame Spectroscopy, Selected Topics,** R. Mavrodineanu, Ed., *pp. 47–77 (Springer-Verlag Publishing Co., New York, N.Y., 1970).*

Key words: Accuracy; atomic absorption; detection limits; differential method sensitivity; flame emission; nonaqueous media; precision; tables.

This chapter on sensitivity, detection limits, precision and accuracy in Flame Emission and Atomic Absorption spectrometry discusses the principles, definitions and methodology in establishing and evaluating these criteria. The various instrumental components and their optimum operation are described to enable the analyst to achieve these goals. Tables of data for all reported elements are presented for the current results on detection limits and sensitivity. The problem associated with the environment of the analyte and the effect of nonaqueous media are discussed from the standpoint of enhanced sensitivity. Finally the criteria for attaining improved precision and accuracy are discussed and the role of the differential method, ionization buffers and standard additions is discussed.

Milligan, D. E., Jacox, M. E., **Infrared spectrum and structure of intermediates in the reaction of OH with CO,** *J. Chem. Phys.* **54,** *No. 3, 927–942 (February 1, 1971).*

Key words: CHO_2 free radical; force constants; infrared spectrum; matrix isolation; reaction of OH with CO; stereoisomers; vacuum-ultraviolet photolysis.

Upon vacuum-ultraviolet photolysis of H_2O in a CO matrix at 14 K, infrared absorptions of HCO, H_2CO, HCOOH, and CO_2 become prominent. Furthermore, new absorptions due to reactive product species appear at 615, 620, 1077, 1088, 1160, 1261, 1797, 1833, 3316, and 3456 cm^{-1}. These absorptions diminish in intensity when the sample is subjected to radiation in the 2000–3000-Å spectral range. Detailed consideration of the processes which may occur in this system and extensive isotopic substitution studies support the assignment of these absorptions to the cis- and trans-stereoisomers of H–O–C=0, produced by the reaction of OH with the CO matrix. Valence force potentials having only small contributions from interaction terms have been found which correspond to a physically reasonable vibrational assignment and which satisfactorily reproduce the pattern of observed frequencies for the various isotopic species of both *c*- and *t*-HOCO. Evidence suggests that *c*- and *t*-HOCO photodecompose to produce H atoms and CO_2.

Missoni, G., Dick, C. E., Placious, R. C., Motz, J. W., **Inelastic atomic scattering of 0.1-, 0.2-, 0.4-, and 3.0-MeV electrons,** *Phys. Rev. A.* **2,** *No. 6, 2309–2317 (December 1970).*

Key words: Experimental cross sections; inelastic electron scattering; 0.1 to 3.0 MeV, carbon, copper, gold, multiple scattering.

Spectral data obtained with a magnetic spectrometer are presented for inelastic electron scattering from thin targets of carbon, copper, and gold at incident electron energies of 0.1, 0.2, 0.4, and 3.0 MeV, for scattering angles between 20 and 120 degrees. For angles less than 90 degrees, each spectrum consists of (a) a Møller line which has a half width that increases with atomic number and which yields an experimental cross section that agrees within experimental error with the theoretical Møller cross section, and (b) a low energy continuum which rises steeply at energies less than 40 keV. For angles greater than 90 degrees, the Møller line which is kinematically forbidden vanishes, but the steeply rising continuum remains. This continuum may arise from single electron-atom scattering and from multiple scattering in the target. The latter process depends on target thickness. The experimental results for this low energy continuum tend to confirm that the multiple scattering effects as calculated by Ford and Mullin dominate the single scattering process as calculated by Weber, Deck, and Mullin, and by Kolbenstvedt and Cooper even for an 11 $\mu g/cm^2$ carbon target which was the most favorable case for studying the single scattering process. Because of multiple scattering, accurate experimental data for the low-energy continuum produced by single electron-atom inelastic scattering can best be obtained with gas targets.

Mohan, R., Danos, M., Biedenharn, L. C., **Isospin impurities in the nuclear ground states,** *Phys. Rev. C.* *3, No. 2, 468–479 (February 1971).*

Key words: Excess neutrons; isospin; nuclear charge distribution; nuclear structure; three-fluid model; two-fluid model.

Isospin impurities in the ground states of some even-even nuclei are calculated in the shell model including the effective residual interactions and in the three-fluid model. It is shown that the residual interactions reduce the calculated impurities by an order of magnitude. The impurities given by the three-fluid model are even smaller. Comparison of the present results is made with those of the two-fluid model.

Moore, C. E., **Selected tables of atomic spectra. A Atomic energy levels-second edition. B Multiplet tables. C I, C II, C III, C IV, C V, C VI. Data derived from the analyses of optical spectra,** *Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 3, Sec. 3, 71 pages (Nov. 1970) $1.00, SD Catalog No. C13.48:3/Sec. 3.*

Key words: Atomic energy levels, carbon spectra; atomic spectra of carbon; carbon spectra; multiplet tables, carbon spectra; spectra, carbon; wavelengths, carbon spectra.

The present publication is the third Section of a series being prepared in response to the persistent need for a current revision of two sets of tables containing data on atomic spectra as derived from analyses of optical spectra. As in the first two Sections, Part A contains the atomic energy levels and Part B the multiplet tables. All six spectra of carbon, C I through C VI are included. The form of presentation is described in detail in the text to Section 1, and need not be repeated here.

Murphey, W. M., Caswell, R. S., **Analysis of results of the Bureau International des Poids et Mesures thermal neutron flux density intercomparison,** *Metrologia* **6,** *No. 4, 111–115 (October 1970).*

Key words: Data analysis; flux density; intercomparisons; least squares; standards; thermal neutrons.

The results of an international comparison of thermal neutron flux density standards sponsored by the Neutron Working Group of the Bureau International des Poids et Mesures have been analyzed using a method conceptually different from a companion analysis by Axton. Both methods, however, yield closely the same results. All individual values are within ±2.6% of the adjusted value, the average absolute deviation being about 1%.

Napolitano, A., Hawkins, E. G., **Standard Reference Materials: Viscosity of a standard borosilicate glass (Certification of Standard Reference Material 717),** *Nat. Bur. Stand. (U.S.), Spec. Publ. 260–23, 10 pages (Dec. 1970) 25 cents, SD Catalog No. C13.10:260–23.*

Key words: Beam-bending; borosilicate glass; glass viscosity; parallel-plate; rotating cylinder; standard reference material; viscosity; viscosity standard.

The viscosity of a borosilicate glass has been measured at the National Bureau of Standards and four other laboratories. Determinations were made in the range 10^2 to 10^{15} poises (1525 to 470 °C). Measurements were made by the rotating cylinder, fiber elongation, beam bending, and parallel-plate methods. The results have been evaluated and the glass has been issued as Standard Reference Material No. 717.

Page, C. H., Vigoureux, P., Editors, **The international system of units (SI),** *Nat. Bur. Stand. (U.S.), Spec. Publ. 330, 42 pages (Jan. 1971), 50 cents, SD Catalog No. C13.10:330.*

Key words: General Conference of Weights and Measures; International Committee of Weights and Measures; International System of Units; SI; Systemè International des Unités; units of measurement.

This translation from the French "Le Système International d'Unités", (SI) published originally by the International Bureau of Weights and Measures (BIPM) has been prepared jointly by the National Physical Laboratory, UK, and the National Bureau of Standards, USA. Included are Resolutions and Recommendations of the General Conference of Weights and Measures (CGPM) on the International System of Units, together with relevant extracts from the International Organization for Standardization (ISO) for the practical use of the system.
Appendix I gives in chronological order the decisions promulgated since 1889 by CGPM and the International Committee of Weights and Measures (CIPM) on units of measurement and on SI. Appendix II outlines the measurements, consistent with the theoretical definitions given in this document, which metrological laboratories can make to realize the units and to calibrate precision material standards.

Paule, R. C., Mandel, J., **Analysis of interlaboratory measurements on the vapor pressures of cadmium and silver.** *(Certification of Standard Reference Materials 746 and 748), Nat. Bur. Stand. (U.S.), Spec. Publ. 260–21, 30 pages (Jan. 1971), 35 cents, SD Catalog No. C13.10:260–21.*

Key words: Cadmium; components of error (within- and between-laboratory); heats of sublimation (second and third law); interlaboratory measurements; silver; standard errors; standard reference materials; vapor pressure.

Detailed statistical analyses have been made of results obtained from a series of interlaboratory measurements on the vapor pressures of cadmium and silver. Standard Reference Materials 746 (cadmium) and 748 (silver) which were used for the measurements have been certified over the respective pressure ranges 10^{-11}–10^{-4} atm and 10^{-12}–10^{-3} atm. The temperature ranges corresponding to these pressures are 350–594 K for cadmium and 800–1600 K for silver. The heats of sublimation at 298 K and the associated two standard error limits for cadmium and silver are 26660±150 cal/mol and 68010±300 cal/mol, respectively. Estimates of uncertainty have been calculated for the certified temperature-pressure values as well as for the uncertainties expected from a typical single laboratory's measurements. The statistical analysis has also been made for both the second and third law methods, and for the within- and between-laboratory components of error. The uncertainty limits are observed as functions of both the heat of sublimation and the temperature.

Peavy, S. T., Varner, R. N., Hogben, D., **Source listing of OMNITAB II program,** *Nat. Bur. Stand. (U.S.), Spec. Publ. 339, 371 pages (Dec. 1970) $4.75, SD Catalog No. C13.10:339.*

Key words: Accuracy; algorithms; ANSI FORTRAN; documentation; error checking; machine independent; OMNITAB II operating system subprograms; OMNITAB II source listing; programming techniques; transportable; user-oriented computing system.

OMNITAB II is a general-purpose interpretive computing system designed to allow a nonprogrammer to use a high-speed computer easily, accurately and effectively. The system permits the user to perform arithmetic operations including complex arithmetic, trigonometric calculations, miscellaneous function calculations, statistical analysis, Bessel function calculations, and operations on matrices and arrays.
The OMNITAB II system contains 177 subprograms written in the ANSI FORTRAN language. Every effort has been made to make the system transportable. This publication contains a complete listing of all these subprograms. The listing is preceded by a brief introduction which describes the programming techniques used; the use of system library functions; and the subprograms used to control the flow of operations in the OMNITAB system.

Plummer, E. W., Gadzuk, J. W., **Surface states on tungsten,** *Phys. Rev. Letters* **25,** *No. 21, 1493–1495 (November 23, 1970).*

Key words: Electrons; single crystal faces of tungsten; spin-orbit split bands; tungsten.

The energy distribution of field emitted electrons from single crystal faces of tungsten exhibit structure which is extremely sensitive to surface contaminants. The structure for the (100) plane has the correct shape and energy expected for surface states resulting from spin-orbit split bands. These results are in good agreement with recent theoretical predictions.

Preston, J. D., Forthofer, R. J., **Correlation of vehicle, dynamometer and other laboratory tests for brake friction materials,** *Proc. Society of Automotive Engineers Conf., Detroit, Michigan, January 11–15, 1971, Paper No. 710250, pp. 1–10 (1971).*

Key words: Brake friction materials; coefficient of friction; friction assessment screening test machine; friction materials test machine, girling scale dynamometer; inertia brake dynamometer; vehicle road tests.

The frictional properties of brake lining materials are greatly influenced by the manner in which they are used. Test procedures designed to measure the coefficient of friction of these materials can likewise produce widely differing results depending on the type of test conducted. This paper presents data illustrating the performance correlation of three commercially available brake lining materials when subjected to vehicle tests and some of the more commonly used laboratory test procedures.

Richmond, J. C., Editor, **Space simulation.** *Proceedings of a Conference held at NBS Gaithersburg, Maryland, September 14–16, 1970. Nat. Bur. Stand. (U.S.), Spec. Publ. 336, 984 pages (October 1970), $5.25, SD Catalog No. C13.10:336.*

Key words: Ablation; particulate radiation; reentry; space-simulation; thermal radiation; vacuum; weightlessness.

This volume contains all of the papers presented at the Fifth Space Simulation Conference held at the National Bureau of Standards September 14–16, 1970, that were available for publication. The general scope of the conference was the effect of the space environment on materials, components, structures and man. The range of topics is too wide to permit a simple classification, but contamination, ablation, degradation of materials by the space environment and predictive testing account for approximately half of the papers presented. Other topics range from purely laboratory problems such as radiometry standards, calibration of vacuum gages, cryopumping and operation of space simulation facilities to gravity simulation, with neutral buoyancy for zero gravity and a manrated centrifuge for high gravity, use of a drifting submarine to study the psychological aspects of long-duration missions in a space station, and simulation of (1) atmospheric balloon environments, (2) radiation from nuclear power sources, (3) solar wind, (4) micro-meteoroid bombardment, (5) soil friction on the moon and (6) the Martian atmosphere.

Rosenstock, H. M., Botter, R., **Franck-Condon principle for the ionization of polyatomic molecules** (*Proc. Intern. Conf. on Mass Spectroscopy, Kyoto, Japan, Sept. 1969*), *Chapter in Recent Development in Mass Spectroscopy*, K. Ogata and T. Hayakawa, Eds., *pp. 797–806* (*University of Tokyo Press, Tokyo, Japan, 1970*).

Key words: C_2H_2, NH_3, H_2O, N_2O; Franck-Condon principle; photoelectrons; photoionization; spectroscopy.

Recent work on the application of the Franck-Condon principle to the ionization of polyatomic molecules is reviewed. The vibrational structure of ionization curves in C_2H_2, H_2O, NH_3 and N_2O, is discussed. Examples are given illustrating various problems encountered in Franck-Condon problems, including choice of frequencies and force fields and the importance of normal coordinate transformation between two states of different geometry and symmetry.

Smith, R. W., Jr., Conference Chairman, Editor, **Precoordination-basis for industrialized building** (*Proc. Conf. Gaithersburg, Md., Sept. 24–26, 1969*), *Nat. Bur. Stand. (U.S.), Bldg. Sci. Ser. 32, 136 pages (Jan. 1971) $1.50, SD Catalog No. C13.29/2:32.*

Key words: Building; components; precoordination; standards.

The Conference entitled "Precoordination—Basis for Industrialized Building" was held at the National Bureau of Standards, Gaithersburg, Md., on September 24–26, 1969. The Conference was sponsored by the American National Standards Institute's Committee A62, Precoordination of Building Components and Systems, to explore the standards required to establish a basis for an industry-wide system of building using interchangeable components. Coordinated components, conforming to these standards, will be compatible and interchangeable in both dimension and function and thereby offer unlimited opportunities for product and material selection as well as designed flexibility.

Spijkerman, J. J., Travis, J. C., Pella, P. A., DeVoe, J. R., **Preliminary study on the characteristics and design parameters for a Mössbauer resonant detector,** *Nat. Bur. Stand. (U.S.), Tech. Note 541, 65 pages (Jan. 1971), 65 cents, SD Catalog No. C13.46:541.*

Key words: Conversion electrons; iron; Mössbauer spectroscopy; resonant detector.

Progress in the design and fabrication of a resonant detector for Mössbauer Spectroscopy is described. This report begins with a review of all of the methods of detection for this spectroscopy and describes the expected advantages of the resonant detector. If one uses conversion electron detection, considerable enhancement in signal to noise ratio and decrease in linewidth may be realized. Efforts to produce an iron bearing resonant material are described.

Sullivan, D. B., Peterson, R. L., Kose, V. E., Zimmerman, J. E., **Generation of harmonics and subharmonics of the Josephson oscillation,** *J. Appl. Phys.* **41,** *No. 12, 4865–4873 (November 1970).*

Key words: Josephson effect; superconductivity.

The observation of harmonics and subharmonics of the Josephson oscillation is shown to be in agreement with a rather simple model of the junction. The generation of harmonics provides an explanation of induced steps in the current-voltage characteristic which occur at submultiples of the usual induced step voltages. The subharmonic oscillation is seen to be a relaxation-like process which can be easily understood in terms of a mechanical analog.

Tighe, N. J., **Microstructure of fine-grain ceramics** (*Proc. 15th Sagamore Army Materials Research Conf., Sagamore Conference Center, Raquette Lake, N.Y., Aug. 20–23, 1968*), *Chapter in Ultrafine-Grain Ceramics, pp. 109–133 (Syracuse University Press, Syracuse, N.Y., 1970).*

Key words: Alumina; Al_2O_3; ceramics; electron microscopy; fine-grain ceramics; ion bombardment; magnesia; MgO; microstructure; rock; zirconia.

This chapter describes the use of transmission electron microscopy to characterize the microstructure of fine-grain ceramics. Observations have been made on a number of polycrystalline materials including alumina, magnesia, zirconia, metal-ceramic composites, and rock specimens.
Thin sections were prepared by ion bombardment. In these sections grain boundaries, pores, impurity precipitates and dislocations could be observed directly. Crystalline second-phase material formed as grains and small precipitates could be identified by means of electron diffraction. The method of specimen preparatoin and the results obtained from the observation of the specimens will be discussed.

Tipson, R. S., Brady, R. F., Jr., West, B. F., **Cyclic acetals of ketoses. Part IV. Re-investigation of the oxidation of 1,2:4,5-Di-*O*-isopropylidene-β-D-fructopyranose with methyl sulfoxide-acetic anhydride,** *Carbohydrate Res.* **16,** *383–393 (March 1971).*

Key words: Acetals; fructose; ketoses; oxidation; psicose; reduction; ruthenium tetraoxide; sodium borohydride.

For the preparation of pure D-psicose (**5a**) *via* oxidation of 1,2:4,5-di-*O*-isopropylidene-β-D-fructopyranose (**2a**), the latter must be free from its 2,3:4,5 isomer (**6a**), which is oxidized to the corresponding aldosulose acetal. Pure 1,2:4,5-di-*O*-isopropylidene-β-D-*erythro*-2,3-hexodiulo-2,6-pyranose (**3**) undergoes stereospecific reduction with sodium borohydride to give only 1,2:4,5-di-*O*-isopropylidene-β-D-*ribo*-hexulopyranose (**4a**), which exists as two different crystal modifications. Compounds **3** and **4a** have been characterized, and discrepancies in the literature have been explained.

Van Brunt, R. J., Kieffer, L. J., **Angular distribution of O^- from dissociative electron attachment to O_2,** *Phys. Rev. A,* **2,** *No.* **5,** *1899–1905 (November 1970).*

Key words: Angular distribution of O_2; dissociative electron attachment; electron energy.

The angular distribution of O^- produced by electron bombardment of O_2 has been measured in the electron energy range 5.75 eV to 8.40 eV. The results show a strong energy dependence and are consistent with the theory of O'Malley and Taylor if the final O_2^- repulsive resonance state is assumed to have the symmetry $^2\Pi_u$ and if only the first two allowed partial waves of the incident electron corresponding to $L=1$ and $L=3$ contribute. The results indicate that the $L=3$ term becomes more important as energy increases and thereby demonstrate that the single term approximation for the angular distribution does not apply for this process.

Van Brunt, R. J., Kieffer, L. J., **Angular distribution of protons and deutrons produced by dissociative ionization of H_2 and D_2 near threshold,** *Phys. Rev. A* **2,** *No. 4, 1293–1304 (October 1970).*

Key words: Deuterium; dissociation; electron; hydrogen; molecule.

From observations of the kinetic energy distribution of protons and deuterons at corresponding forward and backward angles with respect to the electron beam direction the momentum imparted to the dissociating H_2 (D_2) molecule by the incident electron has been determined for electron energies up to 300 eV. The momentum transfer was found to remain nearly constant at all energies above threshold, although above 100 eV the values obtained for D_2 were systematically higher than the values for H_2. When corrected to the center-of-mass system the angular distribution of H^+ (D^+) near threshold was found to be nonvanishing at $\Theta=90°$ with an anisotropic component which deviates, in a manner suggested by Zare, from the $\cos^2 \Theta$ dependence predicted from a simple dipole-Born approximation.

Varner, R. N., Peavy., S. T., **Test problems and results for OMNITAB II,** *Nat. Bur. Stand. (U.S.), Tech. Note 551, 190 pages (Dec. 1970) $1.50, SD Catalog No. C13.46:551.*

Key words: Accuracy; ANSI FORTRAN; computer system implementation; examples; OMNITAB II; software; test problems.

The lack of test problems and results for many software packages is a great hindrance to both the systems programmer and the general user. In this publication a set of fifty-two test problems and results for the OMNITAB II system is provided to assist individuals in checking the implementation of the OMNITAB II program on their particular computer. The general user will also find these descriptive examples instructive in the use of OMNITAB commands.

Vidal, C. R., Cooper, J., Smith, E. W., **Hydrogen stark broadening calculations with the unified classical path theory,** *J. Quant. Spectry. Radiative Transfer* **10,** *No. 9, 1011–1063 (September 1970).*

Key words: Classical path; hydrogen lines; line wings; one electron theory; Stark broadening; unified theory.

The unified theory has been generalized for the case of upper and lower state interaction by introducing a more compact tetradic notation. The general result is then applied to the Stark broadening of hydrogen. The thermal average of the time development operator for upper and lower state interaction is presented. Except for the time ordering it contains the effect of finite interaction time between the radiator and perturbers to all orders, thus avoiding a Lewis type cutoff. A simple technique for evaluating the Fourier transform of the thermal average has been developed. The final calculations based on the unified theory and on the one-electron theory are compared with measurements in the high and low electron density regime. The unified theory calculations cover the entire line profile from the line center to the static wing and the simpler one-electron theory calculations provide the line intensities only in the line wings.

Vidal, C. R., Cooper, J., Smith, E. W., **Unified theory calculations of Stark broadening hydrogen lines including lower state interactions,** *Nat. Bur. Stand. (U.S.), Mongr. 120, 45 pages (Jan. 1971), 50 cents, SD Catalog No. C13.44:120.*

Key words: Classical path; hydrogen lines; line wings; Stark broadening; unified theory.

Recently published calculations of hydrogen Stark broadening on the basis of the unified classical path theory have been extended to include lower state interactions in the final line profile. A detailed comparison with experiments in the density range 10^{13}–10^{17} cm^{-3} is given.

Walther, H., Hall, J. L., **Tunable dye laser with narrow spectral output,** *Appl. Phys. Letters* **17,** *No. 6, 239–242 (September 15, 1970).*

Key words: Birefringent filter; dye laser; frequency control.

A tunable dye laser with narrow-banded spectral output in the order of 0.01 Å or even smaller is described. This narrow spectral output is obtained by means of a birefringent filter (Lyot filter) which was inserted into the laser cavity. The properties of this laser setup have been investigated and are described.

Watson, R. E., Bennett, L. H., Carter, G. C., Weisman, I. D., **Comments on the Knight shift in bismuth and other p-band diamagnetic metals,** *Phys. Rev. B.* **3,** *No. 1, 222–225 (January 1971).*

Key words: $AuGa_2$; BiIn; bismuth; diamagnetism; Knight shift; NaTl; *p* polarization; V_3Ga.

The role of *p* polarization and conduction electron diamagnetism in some diamagnetic metals and intermetallic compounds with negative Knight shifts is examined.

Weiss, A. W., **A review of theoretical developments in atomic *f*-values** *(Proc. 2nd. Intern. Conf. Beam-Foil Spectroscopy in Nuclear Instruments and Methods, Lysekil, Sweden, June 8–12, 1970), Part II, Lifetimes and transition probabilities, 25–119 in Nucl. Instr. Methods 90, 121–131 (North-Holland Publ. Co., Amsterdam, The Netherlands, 1970).*

Key words: Atomic lifetimes; atomic spectra; configuration interaction; oscillator strengths.

Theoretical work on atomic *f*-values are reviewed with particular emphasis on the relation to recent beam-foil measurements. One-electron models currently in use are reviewed and their limitations and range of applicability are discussed. Many-electron, or multi-configuration, models are also described and their results compared with experiment. Regularities and irregularities along isoelectronic sequences will be discussed, and some current problems will be presented.

Weiss, A. W., **Symmetry-adapted pair correlations in Ne, F^-, Ne^+, and F,** *Phys. Rev. A.* **3,** *No. 1, 126–129 (January 1971).*

Key words: Electron affinity; electron correlation; ionization potential; superposition of configurations.

The superposition of configurations method has been used to calculate, a single pair at a time, the pair correlation energies for Ne, Ne^+, F^-, and F. The approach is essentially a symmetry-adapted variation of Nesbet's formulation of the Bethe-Goldstone scheme for the atomic correlation problem, and the aim of this research was to test the usefulness of the method for predicting such physically observable quantities as ionization potentials and electron affinities. The calcualtions predict an ionization potential for neon of 21.52 eV, compared with 21.56 eV experimental, and a fluorine electron affinity of 3.47 eV, for which the experimental value is 3.45 eV.

Weiss, B–Z., Meyerson, M. R., **Fatigue crack initiation and propagation in chromium diffusion coated TI bearing steel,** *J. Iron Steel Inst.* **208,** *No. 12, 1069–1077 (December 1970).*

Key words: Chromium diffusion coating; columnar grains; fatigue crack initiation; fatigue crack propagation; residual stress; titanium bearing steels.

Chromium diffusion coatings on TI-bearing steel frequently lead to columnar growth beneath the Cr-rich layer. The grains are preferentially oriented. The depth of the columnar zone does not depend on the chromizing time. A high rate of cooling prevents columnar growth. No grain boundary diffusion or carbide formation at the grain boundaries was observed. The Cr-rich layer is structurally homogenous and consists of α-solid solution. The hardness of the coating does not vary with the chromizing time.
Compressive residual stresses were found in the Cr-rich layer. The stresses, whose magnitude does not change with the depth of the layer, may be decreased by additional heat treatment.
Three modes of fatigue crack nucleation were observed all beneath the Cr-rich layer. Cracks were formed after 10% to 18% of total fatigue lifetime. Crack propagation in its initial stages is primarily dependent on the mode of nucleation. In the later stage propagation is dependent on stress and grain size. Fatigue properties may be improved considerably by a factor of 3 to 5 by additional "normalizing" after chromizing.

West, E. D., **Data analysis for isoperibol laser calorimetry,** *Nat. Bur. Stand. (U.S.), Tech. Note 396, 34 pages (Feb. 1971), 40 cents, SD Catalog No. C13.46:396.*

Key words: Calorimetry; laser; laser calorimetry; laser energy; laser power.

Isoperibol calorimeters (those operating in a constant-temperature environment) are used to measure the power and energy in laser beams relative to electrical standards. The derivation of the basic formula is reviewed. Two methods are presented for analyzing the data taken at equal time intervals: (1) An approximate manual method with criteria for avoiding significant errors of approximation and (2) A least squares method for use with automatic digital computers.

Wiese, W. L., **Atomic transition probabilities—A survey of our present knowledge and future needs** *(Proc. 2nd Intern. Conf. Beam-foil Spectroscopy in Nuclear Instruments and Methods, Lysekil, Sweden, June 8–12, 1970).* **Part II, Lifetimes and transition probabilities,** *25–119 in Nucl. Instr. Methods* **90,** *25–33 (North-Holland Publ. Co., Amsterdam, The Netherlands, 1970).*

Key words: Atomic transition probabilities; beam foil spectroscopy; lifetimes; regularities; review.

A general survey of the present status of our knowledge of atomic transition probabilities is given and the principal methods for obtaining the numerical data are briefly reviewed on a critical basis. Areas of particular relevance to beam foil spectroscopy are emphasized. Using a number of numerical examples and employing systematic trends and comparison data, some general problems encountered with beam foil data are pointed out. Finally, some of the most pressing future needs for new and improved transition probabilities are indicated.

Wright, J. C., Moos, H. W., Colwell, J. H., Magnum, B. W., Thornton, D. D., $DyPO_4$: A three-dimensional Ising antiferromagnet, Phys. Rev. B. **3,** No. 3, 843–858 (February 1, 1971).

Key words: Critical phenomena; diamond lattice; $DyPO_4$; Ising system; low temperature; magnetic susceptibility; metamagnetism; optical absorption.

The mangetic susceptibility, heat capacity, and optical absorptoin spectrum of $DyPO_4$ have been measured as a function of temperature and magnetic field. The optical absorption spectrum indicates that the magnetic interactions in $DyPO_4$ have the form of the Ising interaction and occur primarily between nearest-neighbors. The magnetic susceptibility and heat capacity measurements have been compared with exact series expansions for a diamond lattice assuming an Ising system with nearest-neighbor interactions. The theoretical calculations are in agreement with the measurements. The temperature dependence of the critical field for the "spin-flip" phase transition has also been determined and compared with the calculated value for the critical field at O K obtained from the spectroscopic measurements.

Yakowitz, H., Fiori, C. E., Michaelis, R. E., **Standard reference materials: Homogeneity characterization of Fe-3Si alloy,** *Nat. Bur. Stand. (U.S.), Spec. Publ. 260–22, 30 pages (Feb. 1971) 35 cents, SD Catalog No. C13.10:260–22.*

Key words: Fe-3Si alloy; homogeneity testing; metallography; microprobe analysis; spectrometric analysis; standard reference materials.

An alloy of iron-3.22 wt ptc silicon (Fe-3Si) was characterized with regard to chemical homogeneity of iron and silicon at the micrometer leve of spatial resolution. This alloy is satisfactory for use as a homogeneous standard for electron probe microanalysis. The samples were cut from coarse-grained sheet stock to a final size of about 3 mm × 3 mm × 0.28 mm thick. Homogeneity was checked by means of quantitative raster scanning in which a square matrix (1.1 mm × 1.1 mm) of individual points is analyzed by the microprobe. Each matrix represents 400 separate analyses. Usually, the same matrix was rerun so that each point was sampled twice. The coefficient of variation for both the iron and silicon is less than one percent. Quantitative microprobe analysis was also carried out on this alloy giving a silicon content of 3.14% and an iron content of 96.9%.

Yates, J. T., Jr., Madey, T. E., **Interactions between chemisorbed species: H_2 and N_2 on (100) tungsten,** *J. Vacuum Sci. Technol.* **8,** *No. 1, 63–68 (January–February 1971).*

Key words: Chemisorption; flash desorption; hydrogen; nitrogen; tungsten; tungsten (100) plane; work function.

The interactions between hydrogen and nitrogen adsorbed species on a (100) tungsten crystal have been investigated by flash desorption methods. When the crystal covered with a monolayer of hydrogen is exposed to gaseous N_2, the nitrogen slowly replaces the two chemisorbed hydrogen β states by means of a slight lowering of the hydrogen desorption energy. This displacement process occurs via slow thermal desorption of hydrogen in the presence of gaseous N_2 when the surface temperature is $\gtrsim 300$ K; no such replacement is observed at 273 K. Coverage measurements indicate that there is a stoichiometric ratio between N atoms adsorbed and H atoms displaced from the crystal at ~ 300 K. Although virtually no hydrogen will adsorb on the nitrogen-covered surface at 300 K, several weakly bound hydrogen states are populated at 100 K on this surface. No chemical difference between the β_1 and β_2 hydrogen species was detected, suggesting that both states originate from adsorbed atoms.

Yokel, F. Y., Mathey, R. G., Dikkers, R. D., **Compressive strength of slender concrete masonry walls,** *Nat. Bur. Stand. (U.S.), Bldg. Sci. Ser. 33, 32 pages (Dec. 1970), 40 cents, SD Catalog No. C13.29/2:33.*

Key words: Buckling; compressive strength; concrete block walls; elastic stability; flexural strength; masonry walls; reinforced concrete masonry walls; slenderness effect; structural stability.

Sixty reinforced and unreinforced concrete masonry walls of different slenderness ratios were tested to failure under vertical loads applied axially and at various eccentricities. Prism specimens, made of similar masonry units and mortars, were also tested under the same loading conditions. Anaylsis of test results indicates that wall strength can be conservatively predicted by evaluating cross-sectional wall capacity on the basis of prism strength and reducing the capacity for slenderness effects by evaluating the added moments attributable to wall deflection. Test results were also compared with allowable loads computed in accordance with the current NCMA standard.

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J. Res. Nat. Bur. Stand. (U.S.), 75B (Mathematical Sciences), Nos. 1 and 2 (January–June 1971), SD Catalog No. C13.22/sec.B:75/1 and 2.

Bounds to truncation errors in biorthogonal polynomial approximations, with illustrative applications to gamma ray transport distributions. L. V. Spencer.
A theorem on matrix commutators. J. M. Smith.
A special permutation matrix decomposition for combinatorial design incidence matrices. E. C. Johnsen and T. F. Storer.
The Casimir check for the algebraic matrices of the configuration $(d+s)^n p$. C. Roth.
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Baker, D. V., Editor, 1970 Technical Highlights of the National Bureau of Standards, Annual Report, Fiscal Year 1970, Nat. Bur. Stand. (U.S.), Spec. Publ. 340, 258 pages (February 1971), $1.50, SD Catalog No. C13.10:340.

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Breden, L. H., Technical Standards Coordinator, Polystyrene plastic sheet, Nat. Bur. Stand. (U.S.), Prod. Stand. 31–70, 14 pages (January 1971), 15 cents, SD Catalog No. C13.20/2:31–70.

Breden, L. H., Technical Standards Coordinator, Polytetrafluoroethylene (PTFE) plastic lined steel pipe and fittings, Nat. Bur. Stand. (U.S.), Prod. Stand. 33–70, 12 pages (Mar. 1971), 10 cents, SD Catalog No. C13.20/2:33–70.

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