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Table of Dielectric Constants and Electric Dipole Moments of Substances in the Gaseous State

UNITED STATES DEPARTMENT OF COMMERCE

NATIONAL BUREAU OF STANDARDS

Table of Dielectric Constants of Pure Liquids

by Arthur A. Maryott and Edgar R. Smith

As the first table of a series on dielectric properties, this Circular provides physicists and chemists with a convenient source for frequently needed data on dielectric constants of standard liquids, inorganic liquids, and organic liquids. The table covers only the low frequency, or "static," values.

The authors critically examined the available literature on more than 800 substances in order to provide "best" values of the dielectric constant. An estimate of accuracy is indicated by a simple scheme on the number of figures retained. Wherever feasible, the variation of dielectric constant with temperature is represented by a concise function; in other cases, values of dielectric constant are tabulated for a number of selected temperatures.

The section on standard liquids recommends as reference liquids ten substances for which the values of dielectric constant range from 1.2 to 80 and are considered to be accurate to 0.2 percent or better.

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Arthur A. Maryott and Floyd Buckley

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TABLE OF DIELECTRIC CONSTANTS AND ELECTRIC DIPOLE MOMENTS OF SUBSTANCES IN THE GASEOUS STATE

Arthur A. Maryott and Floyd Buckley

Values of the dipole moments and other pertinent information are tabulated for approximately 350 substances in the vapor state. All values derived from measurements of dielectric constants have been recalculated by one of two systematic procedures in order to place the work of various investigators on a more comparable basis than exists in the literature. Values obtained independently from microwave spectroscopy and other methods are also included.

Values of the dielectric constants recommended for reference purposes are listed for helium, hydrogen, oxygen, argon, air, nitrogen and carbon dioxide. These selected values were derived from a consideration of radio frequency, microwave, and optical data.

1. Introduction

This tabulation of dielectric constants and electric dipole moments is a continuation of a program for the critical examination of the data of physics and chemistry, sponsored by the National Bureau of Standards in cooperation with the Committee on Tables of Constants and Numerical Data of the National Research Council and the Commission on Tables of Constants of the International Union of Chemistry. The first table of the series on dielectric properties, titled Table of Dielectric Constants of Pure Liquids, appeared as Circular 514 of the National Bureau of Standards.

Values of dielectric constant are listed explicitly only in the section on reference gases, which summarizes the more reliable data derived from optical, microwave, and radio frequency measurements for helium, hydrogen, oxygen, argon, air, nitrogen, and carbon dioxide. The particular values recommended for reference purposes are included.

For most of the substances appearing in the table of dipole moments, the data are expressed in terms appropriate to the Debye theory, and values of the dielectric constant can readily be calculated if desired. All values of the dipole moment obtained from measurements of the dielectric constant have been recalculated by one of two systematic procedures in order to place the work of various investigators on a more comparable basis than exists in the original literature. Values of the dipole moment obtained by several reliable methods which are independent of the Debye theory are also included.

2. Reference Gases

2.1. Treatment of Data

Principal emphasis in the table of reference gases has been placed on data in the optical range of frequencies. With the exception of carbon dioxide which exhibits pronounced dielectric absorption in the infrared region, the low frequency or "static" values of the dielectric constant can be derived from the relation,[1] $\epsilon = n_\infty^2$, where the refractive index for infinite wavelength, n_∞, is obtained from the optical dispersion formula. In a majority of cases, values of the dielectric constant measured at radio frequencies do not appear to be of sufficient accuracy to provide useful information for reference purposes. A limited amount of data of reliability comparable

[1] According to Maxwell's relation, the square of the refractive index is equal to the product of the dielectric constant and the magnetic permeability. However, except for the measurements of refractive index on oxygen and air in the microwave region, the permeability is negligibly different from unity for all cases under consideration.

with the optical data has recently been provided by microwave refractometry.

The tabulated values (ϵ-1) refer to the gas at a temperature of 20° C and a pressure of 1 atm, conditions which closely approximate those of a majority of the experimental investigations. It has been frequent practice to report data extrapolated to the conditions of S.T.P. (0° and 1 atm). As these values are not always exactly comparable, the tabulated values were derived with due consideration for the exact procedure for reduction employed in each case. Where it was necessary to correct the values for air to the carbon dioxide-free basis, the carbon dioxide content was assumed to be 0.03 mole percent.

The recommended value of $(\epsilon\text{-}1)_{20°,\ 1\ atm}$ for each gas represents the mean of all values listed in bold type. These values are regarded as having an accuracy in the neighborhood of 0.1 percent or better. Exceptions are helium and possibly carbon dioxide.

The values of the dielectric constant can be adjusted to somewhat different conditions of temperature and pressure by means of the equation,[2]

$$\frac{(\epsilon\text{-}1)_{t,p}}{(\epsilon\text{-}1)_{20°,\ 1\ atm}} = \frac{p}{760[1+0.003411(t\text{-}20)]}, \quad (1)$$

where p is the pressure in millimeters of mercury, and t is the temperature in degrees Celsius. The errors associated with this equation probably do not exceed 0.1 percent for carbon dioxide and 0.02 percent for the remaining gases at temperatures between 10° and 30° and pressures between 700 and 800 millimeters.

---

[2] Over a more extended range of temperature and pressure, the right hand side of equation (1) should be multiplied by the factor, $(1+\beta_{t,p})/(1+\beta_{20°,p})$, to allow for deviations from the ideal gas law. As reliable values of the temperature dependent coefficient, β, have not been determined experimentally, (with the exception of air—cf. 39 Barrell), estimates of β may be made utilizing the Lorenz-Lorentz relation and compressibility data.

2.2. Table of Dielectric Constants of Reference Gases at 20°C and 1 Atmosphere

Substance	$(\epsilon-1).10^6$	Reference
Helium.....	Radio frequency	
	67.8	31 Watson
	63.7	46 Hector
	64.5	48 Jelatis
	Microwave	
	65.6	51.0 Birnbaum
	65.2	53 Essen
	Optical	
	64.6	13 Koch
	64.5	32 Cuthbertson
Hydrogen.....	Radio frequency	
	$254._0$	31 Watson
	Microwave	
	253.4	53 Essen
	Optical	
	254.1	10.0 Cuthbertson
	253.6	13 Koch
	253.7	21 Kirn
	254.3	31 Tausz
Oxygen.....	Radio frequency	
	$494._3$	34 Watson
	496.2	48 Jelatis
	Microwave[a]	
	494.9	51.0 Birnbaum
	495.0	51 Essen
	494.9	53 Essen
	Optical	
	494.5	10.0 Cuthbertson
	493.5	27 Lowery
	494.7	31 Tausz
	494.4	32 Ladenberg
Argon.....	Radio frequency	
	$513._0$	31 Watson
	516.4	48 Jelatis
	Microwave	
	517.7	51 Essen
	Optical	
	516.8	10.1 Cuthbertson
	517.8	24 Quarder
	517.0	31 Tausz
	516.7	34 Damköhler
Air (dry, CO_2 free).....	Radio frequency	
	$537._0$	34 Watson
	Microwave[a]	
	536.5	51.0 Birnbaum
	536.6	51 Essen
	536.6	53 Essen
	Optical	
	536.9	13 Koch
	535.8	19 Meggers
	536.0	20 Traub
	536.7	24 Quarder
	536.4	27 Lowery
	536.5	31 Tausz
	536.1	34 Koster
	536.3	34 Perard
	535.8	39 Barrell
Nitrogen.....	Radio frequency	
	$547._2$	34 Watson
	Microwave	
	547.3	51.0 Birnbaum
	548.0	51 Essen
	548.0	53 Essen
	Optical	
	548.9	10.0 Cuthbertson
	548.7	13 Koch
	547.2	31 Tausz
Carbon dioxide..	Radio frequency	
	$921._5$	34 Watson
	Microwave	
	922.4	51.0 Birnbaum
	$920._6$	51 Essen

Recommended Values of $(\epsilon-1).10^6$ at 20°C and 1 Atmosphere

	He	H_2	O_2	A	Air (dry, CO_2 free)	N_2	CO_2
Mean value[b].....	65.0	253.8	494.7	517.2	536.4	548.0	922
Avg. dev.....	±.4	±.3	±.2	± .4	±.3	±.5	±1

[a] These values were derived from measurements of the refractive index after making allowance for the magnetic permeability of oxygen. The permeability of oxygen was calculated in accordance with the theory of Van Vleck (cf. D. E. Kerr, Propagation of Short Radio Waves, McGraw-Hill Book Company, Inc., chapter 8) and found to be 1.0000012 at a frequency of 9,000 megacycles per second (51.0 Birnbaum, 53 Essen) and 1.0000015 at a frequency of 24,000 Mc/s (53 Essen).

[b] Mean of all values listed in bold type.

3. Dipole Moments

3.1. Treatment of Data

According to the Debye equation, the molar polarization, P, is given by

$$P = \frac{\epsilon - 1}{\epsilon + 2} V = \frac{4\pi N\alpha}{3} + \frac{4\pi N\mu^2}{9kT}, \qquad (2)$$

where

ϵ = dielectric constant
V = molar volume
α = molecular polarizability (optical plus infrared)
μ = dipole moment
N = Avogadro's number
k = Boltzmann's constant
T = temperature, absolute (°K).

Values of the dipole moment were recalculated by one of the two following procedures.

(a) *Temperature-Variation Procedure.* The molar polarization was assumed to be a linear function of $1/T$, i.e., $P = A + B/T$, and A and B were evaluated by the method of least squares. Then $\mu = 0.01281 \times 10^{-18} \sqrt{B}$ electrostatic units (esu) since $B = 4\pi N\mu^2/9k$. In the analysis of data, preference was given to this procedure. However, where the dipole moment appeared to show a definite dependence upon temperature, where the scope or precision of the data was too limited, or where the value found for A appeared unrealistic in comparison with the molar refraction, the following procedure was used.

(b) *Optical Procedure.* The value of the dipole moment was calculated at each temperature according to the relation,

$$\mu = 0.1281 \times 10^{-18} \sqrt{(P-A)T} \text{ esu},$$

where A was assumed to be equal to the molar refraction for the sodium D line, unless otherwise specified. Average values are listed in the table unless the data indicated a definite variation in dipole moment with temperature.

The table also includes values of the dipole moment obtained by several other methods, namely, Stark effect in microwave spectroscopy, Stark effect in radio-frequency spectroscopy, electric Stern-Gerlach experiment.

3.2. Reliability of the Values of Dipole Moment

In general, values of the dipole moment calculated from measurements of dielectric constant by the temperature variation procedure and from the Stark effect in microwave spectroscopy are the most reliable and usually agree within about 2 percent. However, it is difficult to determine small values precisely by the dielectric method. Although the two methods do not lead to exactly comparable results on theoretical grounds,[3] this distinction is probably of minor significance in most cases.

Values of the dipole moment determined from measurements of dielectric constants by the optical procedure should be regarded as upper limits because the assumption, $A = R$ (molar refraction), ordinarily does not make adequate allowance for the infrared, or "atomic," polarization. If μ_R and μ_A are the values of the dipole moment that would be calculated using the molar refraction and the correct value of A, respectively, then $\mu_R^2 = \mu_A^2 + 1.64 \times 10^{-40} (A-R)T$. The accompanying chart shows the error associated with the optical procedure for values of $(A-R)$ of the order usually expected.

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[3] In the temperature variation procedure, it is assumed that $dP/d(1/T) = \text{Constant}$. Consequently, it is implied that the quantum correction to the Debye equation (27 Van Vleck) is negligibly small and the fraction of molecules in any excited states of significantly different dipole moment is also negligibly small. Values of the dipole moment obtained from microwave spectroscopy refer to a particular vibrational state.

$\frac{\mu_R - \mu_A}{\mu_R}$ X 100 for $T = 300°$

μ_R X 10^{18} esu \ A-R cc	0.5	1	2	4	6
0.5	5	11	28	107	.....
1	1.2	2.5	5	11	19
2	0.3	0.6	1.2	2.5	3.9
3	.1	.3	0.5	1.1	1.7
4	.1	.2	.3	0.6	0.9

The precision and accuracy that have been obtained with the molecular beam method are comparatively low. Data are tabulated only for the alkali halides which, until recently, had not been investigated by any other methods. The newly developed techniques of radio frequency spectroscopy would appear to offer greater promise in this direction although results to date are rather meager.

3.3. Explanation of the Table of Dipole Moments

COLUMN 1. ARRANGEMENT OF SUBSTANCES. The order of listing the inorganic substances is alphabetical according to the chemical formulas as customarily written. Formulas for the organic compounds are written with carbon first and hydrogen, if present, second. Symbols for all remaining elements then follow in alphabetical sequence. The order of listing these compounds is determined first by the number of carbon atoms, secondly by the number of hydrogen atoms, and finally by the symbols for the remaining elements in alphabetical order.

COLUMN 2. μ—THE DIPOLE MOMENT. The uncertainties that frequently accompany the values of the dipole moment have the following significance.

a. Where the temperature variation procedure was employed, they are the uncertainties corresponding to the standard deviation in B, the slope of the Debye plot. They are included only where data were available at four or more temperatures.

b. Where the dipole moment was obtained by other methods, the uncertainties are those estimated by the authors.

COLUMN 3. "A"—the sum of the optical and infrared contributions to the molar polarization. The method employed to determine the dipole moment is indicated in this column according to the following scheme.

a. *Numerical Value of "A" Listed.* The measurements of dielectric constant were analyzed by the temperature variation procedure except in cases where the value of the dipole moment is listed as zero. In such cases the experimental data were generally inconclusive and the assignment of zero values was based primarily upon considerations of molecular symmetry. The standard deviation in "A" is included where the analysis involved data at four or more temperatures.

b. "....."—the dielectric constant measurements were analyzed by the optical procedure using for A the value of the molar refraction specified in column 4.

c. *M Stark.* The dipole moment was obtained from a study of the Stark effect on the microwave absorption spectrum (cf. 50.1 Shulman). The values usually refer to the ground vibrational state unless otherwise specified.

d. *R Stark.* This method utilizes a molecular beam technique in studying the Stark effect in radio frequency spectroscopy. (cf. 47 Hughes).

e. *Mol. Beam.* The dipole moment was obtained from the electric Stern-Gerlach experiment in which a molecular beam is deflected by an inhomogeneous electric field.

COLUMN 4. R—THE MOLAR REFRACTION. The values of the molar refraction refer to the sodium D line unless accompanied by a subscript giving the wavelength in millimicrons. A majority of these values were taken from the cited dielectric literature, but those inclosed in parentheses were obtained as follows:

$(R)_{\Sigma}$—by summation of the atomic refractions for the sodium D line given in Landolt-Börnstein Tabellen, 5th ed.

$(R)_{L}$—from data in Landolt-Börnstein Tabellen, 5th ed.

$(R)_{T}$—from data in Physicochemical Constants of Pure Organic Substances, J. Timmermans, Elsevier Publishing Co., Inc., New York, N. Y.

COLUMN 5. TEMPERATURE RANGE (°K).

T_1; T_2—denotes observations at the temperatures T_1 and T_2.

T_1-T_2—denotes observations at three or more temperatures in the range T_1 to T_2.

COLUMN 6. REFERENCES. Some additional references for which no data have been included are inclosed in brackets. The complete bibliography in chronological order appears at the end of this table.

A. INORGANIC GASES

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
$AsCl_3$	Arsenic trichloride.....	1.59 ± .01	37.6 ± .2	$(28.5)_L$	380-470	37 Grassi
AsF_3	Arsenic trifluoride.....	2.815 ± .025	M Stark		.....	50.1 Shulman
AsH_3	Arsine.....	0.16	14.5		226-373	27 Watson
AsH_2D	Arsine-*d*.....	0.22 ± .02	M Stark		.....	51 Loomis
BCl_3	Boron chloride.....	0.59[a] ± .01	23.9 ± .3	$(20.1_\infty)_L$	308-450	37 Grassi
BF_3	Boron fluoride.....	0	8.90	6.09_∞	193; 298	36 Watson
		0	8.36		293-472	37 Linke
BH_3CO	Borine carbonyl.....	1.795[b]	M Stark		.....	49.2 Strandberg
B_2H_6	Diborane.....	0	14.46	12.91_∞	193; 298	35 Ramaswamy
$B_3H_6N_3$	Triazatriborine.....	ca 0	ca 23.8	20.2_∞	298	35 Ramaswamy
B_5H_9	Pentaborane.....	2.13 ± .04	M Stark		.....	52 Hrostowski
BrCl	Bromine chloride.....	0.57 ± .02	M Stark		.....	50.1 Smith
BrF	Bromine fluoride.....	1.29	M Stark		.....	50.0 Smith
Br_2	Bromine.....	0	17.7	$(16.3_\infty)_L$	293-412	33 Luft
ClF	Chlorine fluoride.....	0.88	M Stark		.....	49 Gilbert
ClF_3	Chlorine trifluoride.....	0.554 ± .002	15.94 ± .11		273-356	52 Magnuson
CsCl	Cesium chloride.....	10.5 ± .25	R Stark		.....	51 Luce
CsF	Cesium fluoride.....	7.42 ± .47	R Stark		.....	49 Hughes
		7.89[c] ± .17	R Stark		.....	49 Trischka
CsI	Cesium iodide.....	10.2	Mol. beam		873	36 Rodebush
$GeCl_4$	Germanium tetrachloride...	0	38.0	31.5	369-501	38.0 Coop
GeH_3Cl	Chlorogermane.....	2.03	.....	16.9	275-297	40 Smyth
		2.13	M Stark		.....	49 Dailey
HBr	Hydrogen bromide.....	0.80 ± .01	9.1 ± .2	(8.87_∞)[d]	218-599	24 Zahn
HCl	Hydrogen chloride.....	1.050 ± .004	7.63 ± .21	(6.51_∞)[d]	201-589	24 Zahn
		1.077 ± .019	6.63 ± .39		286-373	31 Braune
		1.081 ± .004	6.98 ± .14		291-517	38 Bell
						[27 von Braunmühl]
DCl	Deuterium chloride.....	1.085 ± .001	7.16 ± .04	(6.50_∞)[d]	291-517	38 Bell
HF	Hydrogen fluoride.....	1.91	.....	2.0	305-374	46.0 Hannay
		1.91	.....		296-333	48 Oriani
HI	Hydrogen iodide.....	0.42	13.5	$(13.2_\infty)_L$	245-346	24 Zahn
HN_3	Hydrazoic acid.....	0.847[f] ± .005	M Stark		.....	50 Amble
H_2O	Water.....	1.85	3.9	3.67_∞	423-483	32 Sanger
		1.844 ± .030	4.3 ± 1.8		383-484	35 Groves
		1.844 ± .007	4.0 ± .6		394-462	35 Stranathan
		1.850 ± .027	3.4 ± 1.7		384-522	42.1 Hurdis
		1.853 ± .011	3.8 ± .7		298-376	52 Birnbaum
						[48 Golden]
						[48 Crain]

[a] The finite moment is probably attributable to the presence of impurities as zero moment would be expected from structural considerations. [b] $\mu = 1.770$ for the excited vibrational state, $v_1 = 1$. [c] $\mu = 7.98 \pm 0.18$ for the first excited vibrational state. [d] T. Larson, Z. Physik 111, 391 (1938). [f] For the dipole component along the NNN axis.

Substance		$\mu \times 10^{18}$esu	A	R	Temperature (°K)	Reference
DHO	Deuterium hydrogen oxide..	1.84 ±.01	M Stark		.....	49.3 Strandberg
						[48.0 Strandberg]
D_2O	Deuterium oxide.....	1.861 ±.016	3.6 ±1.2	$(3.63_{\infty})^g$	364-473	35 Groves
		1.87 ±.02	M Stark		.....	52 Beard
						[48.1 Strandberg]
H_2S	Hydrogen sulfide.....	0.92 ±.01	9.96 ±.64	$(9.25_{\infty})^d$	197-542	28 Zahn
HDS	Hydrogen sulfide-*d*.....	1.02	M Stark		.....	50 Hillger
Hg	Mercury.....	0	12.7	$(12.7_{\infty})_L$	674-743	36 Wüsthoff
						[29 Kruger]
$HgBr_2$	Mercuric bromide.....	0	36.5	29.3_{∞}	614-695	35 Braune
$HgCl_2$	Mercuric chloride.....	0	29.2	22.9_{∞}	599-701	35 Braune
HgI_2	Mercuric iodide.....	0	48.3	41.6_{∞}	568-701	35 Braune
ICl	Iodine chloride.....	0.54 ±.01	30.9 ±.3		334-435	33 Luft
		0.65 ±.07	([h])		.....	46 Townes
KBr	Potassium bromide.....	9.1	Mol. beam		920	36 Rodebush
KCl	Potassium chloride.....	6.3	Mol. beam		1023	34 Scheffers
		8.0	Mol. beam		949	36 Rodebush
KF	Potassium fluoride.....	7.33 ±.24	R Stark		.....	50 Grabner
KI	Potassium iodide.....	6.8	Mol. beam		950	34 Scheffers
		9.2	Mol. beam		898	36 Rodebush
Kr	Krypton.....	0	6.26	6.27_{∞}	298	36 Watson
NF_3	Nitrogen fluoride.....	0.22	9.02	7.03_{∞}	193-368	35 Ramaswamy
		0.25	9.12		193-368	36 Watson
NH_3	Ammonia.....	1.469 ±.006	5.3 ±.4	$(5.54_{\infty})_L$	274-457	26 Zahn
		1.477 ±.006	5.3 ±.4		274-423	35 de Bruyne
		1.46	5.9		294-419	47 Le Fevre
		1.438 ±.011	6.5 ±.7		279-403	48 van Itterbeek
		1.468 ±.009	M Stark		.....	51 Coles
						[33 Uhlig]
						[36 Watson]
ND_3	Deuteroammonia.....	1.509 ±.005	4.3 ±.3		274-425	35 de Bruyne
NO	Nitrogen oxide.....	0.07 ±.02	4.74 ±.07		235-477	33.0 Smyth
		0.16	4.31	4.30_{∞}	193;298	34 Watson
NOF	Nitrosyl fluoride.....	1.81	M Stark		.....	51.0 Magnuson
NO_2	Nitrogen dioxide.....	0.39	.....	7.63	297-397	33.0 Zahn
	Dimer (N_2O_4).....	0.55	.....	16.75	297-397	33.0 Zahn
	Monomer.....	0.58	.....	7.62	298	36 Williams
		.41			343	
		.30			398	
	Dimer (N_2O_4).....	0	16.87	16.73	298-398	36 Williams
	Monomer.....	0.32	.....	7.62_{644}	298-372	38 Schulz

[d] T. Larson, Z. Physik 111, 391 (1938).
[g] Cuthbertson, C. and Cuthbertson, M., Proc. Roy. Soc. (London) A155, 213 (1936).
[h] Dipole moment calculated from the intensity of microwave absorption.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
NO_2—Con.	Dimer (N_2O_4).....	0.42	.....	16.76_{644}	298-372	38 Schulz
NO_2F	Nitryl fluoride.....	0.47	M Stark		.....	52 Smith
N_2O	Dinitrogen oxide.....	0.14 ±.01	7.85 ±.05		293-454	34 Czerlinsky
		0.17	7.76	7.36_{∞}	193-298	34 Watson
		0.16	M Stark		.....	49 Coles
		0.166 ±.002	M Stark		.....	50.1 Shulman
						[27 von Braunmühl]
						[29.1 Ghosh]
						[30 Schwingel]
NaI	Sodium iodide.....	4.9	Mol. beam		950	34 Scheffers
Ne	Neon.....	0	1.001	$(0.997_{\infty})_L$	82;298	36 Watson
		0	1.000		298	48 Jelatis
O_3	Ozone.....	0.52	8.1	$(7.2_{\infty})_L$	194-360	50 Epprecht
		0.65 ±.05	R Stark		.....	51 Hughes
OsO_4	Osmium tetroxide.....	0	20.6	16.6	429-561	40.2 Linke
PCl_3	Phosphorus trichloride....	0.78 ±.01	32.2 ±.2	$(26.0)_L$	306-463	33 Grassi
PF_3	Phosphorus trifluoride....	1.025 ±.005	M Stark		.....	50.1 Shulman
PF_5	Phosphorus pentafluoride..	0	15.4	9.6	283-388	37 and 40.2 Linke
PH_3	Phosphine.....	0.55	12.21	$(10.8)_L$	226-373	27 Watson
PH_2D	Phosphine-*d*.....	0.55 ±.01	M Stark		.....	51 Loomis
POF_3	Phosphorus oxyfluoride....	1.735 ±.035	M Stark		.....	50 Senatore
		1.69 ±.05	M Stark		.....	52 Hawkins
		1.77 ±.02	M Stark		.....	52 Ghosh
PSF_3	Phosphorus thiofluoride...	0.633 ±.02	M Stark		.....	52 Hawkins
SF_6	Sulfur hexafluoride.....	0	16.5	11.31_{∞}	193;298	34 Watson
		0	16.8		301	38 Fuoss
		0	15.7		292	40.2 Linke
S_2F_{10}	Disulfur decafluoride.....	0	33.4		298	51 Hollies
$SOCl_2$	Thionyl chloride.....	1.452 ±.004	25.2 ±.3	21.0_{∞}	288-407	39 Coop
SO_2	Sulfur dioxide.....	1.633 ±.006	10.6 ±.4		266-444	26 Zahn
		1.590 ±.025	13.7 ±1.8		292-353	37 Smits
		1.631 ±.011	10.8 ±.8	9.54_{∞}	289-457	50.0 Le Fevre
		1.59 ±.01	M Stark		.....	51 Crable
						[51 Lovering]
SO_2Cl_2	Sulfuryl chloride.....	1.81	26.4	20.7_{∞}	293-416	39 Coop
SO_2F_2	Sulfuryl fluoride.....	0.228 ±.004	M Stark		.....	52 Fristrom
SO_3	Sulfur trioxide.....	0	12.20	10.55_{∞}	353-433	37 Smits
SbH_2D	Stibine-*d*.....	0.116 ±.003	M Stark		.....	51 Loomis
SeF_6	Selenium hexafluoride.....	0	18.5	13.4	293	40.2 Linke
SiF_4	Silicon tetrafluoride.....	0	13.75	8.38_{∞}	193;298	34 Watson

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
$SiHCl_3$	Trichlorosilane.....	0.858 ±.001	27.0 ±.1		285-414	38 Brockway
$SiHF_3$	Trifluorosilane.....	1.26 ±.02	M Stark		.....	52 Ghosh
SiH_2Cl_2	Dichlorosilane.....	1.167 ±.005	22.5 ±.2		291-397	38 Brockway
SiH_3Br	Bromosilane.....	1.31 ±.03	M Stark		.....	50.1 Sharbaugh
SiH_3Cl	Chlorosilane.....	1.292 ±.006	17.7 ±.3		288-402	38 Brockway
		1.31	M Stark		.....	49 Dailey
SiH_3F	Fluorosilane.....	1.268 ±.013	M Stark		.....	50.0 Sharbaugh
SiH_4	Silane.....	0	13.71	11.95_{∞}	240;298	34 Watson
Si_2H_6	Disilane.....	0	28.10	23.72_{∞}	298	34 Watson
$SnBr_4$	Stannic bromide.....	0	55.6	47.7_{∞}	418-519	38.0 Coop
$SnCl_4$	Stannic chloride.....	0	45.5	34.6_{∞}	363-473	38.0 Coop
SnI_4	Stannic iodide.....	0	81.4	70.1_{∞}	526	38.0 Coop
TlCl	Thallium chloride.....	4.44	R Stark		.....	52 Carlson
TeF_6	Tellurium hexafluoride....	0	22.7	15.0	292	40.2 Linke
$TiCl_4$	Titanium tetrachloride....	0	41.3	37.8	373;481	38.0 Coop
UF_6	Uranium hexafluoride.....	0	30.7		293	48 Amphlett
		0	31.5		313-356	51.1 Magnuson
Xe	Xenon.....	0	10.09	10.14_{∞}	298	36 Watson

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_1					
CBr_2F_2	Dibromodifluoromethane....	1.02	.....	$(22.1)_\Sigma$	302	38 Fuoss
$CClF_3$	Chlorotrifluoromethane....	0.65[j]	.....	$(11.4)_\Sigma$	302	38 Fuoss
		0.39	15.7		273-420	50 Epprecht
CClN	Cyanogen chloride.....	2.802 ±.020	M Stark		.....	50.1 Shulman
CCl_2F_2	Dichlorodifluoromethane...	0.505 ±.002	20.23 ±.03		305-470	33.1 Smyth
		0.70[k]	.....	$(16.4)_\Sigma$	302	38 Fuoss
		0.55	19.7		300-410	50 Epprecht
CCl_2O	Phosgene.....	1.19 ±.01	18.4 ±.4	$(16.6_\infty)_L$	303-425	34.0 Smyth
CCl_2S	Thiophosgene.....	0.29	25.7		303-414	39 Coop
CCl_3F	Trichlorofluoromethane....	0.45 ±.03	23.9 ±.6		299-376	33.1 Smyth
		0.68[l]	.....	$(21.3)_\Sigma$	299	38 Fuoss
CCl_3NO_2	Trichloronitromethane.....	1.89	.....	$(27.3)_L$	344	34.0 Smyth
CCl_4	Carbon tetrachloride.....	0	28.14	$(25.83_\infty)_L$	296;368	36 Ramaswamy
						[26 Sanger]
						[36 Niini]
CF_4	Carbon tetrafluoride.....	0	9.73	7.12_∞	193-368	35 Ramaswamy
		0	10.1		298;368	36 Watson
		0	9.7		298	38 Fuoss
CN_4O_8	Tetranitromethane.....	0	38.6	36.0_{546}	355	38.0 Coop
CO	Carbon monoxide.....	0.097 ±.004	5.01 ±.03		90-391	28 Zahn
		0.10	4.98	4.89_∞	83;298	34 Watson
		0.117 ±.005	4.65 ±.02		273-373	48 van Itterbeek
						[27 von Braunmühl]
CO_2	Carbon dioxide.....	0	7.35	6.54_∞	298	36 Watson
COS	Carbonyl sulfide.....	0.67 ±.01	14.4 ±.2	(12.8_∞)[i]	202-365	28 Zahn
		0.72	M Stark		.....	46 Dakin
		0.72	.....		265;333	48 Jelatis
	$C^{12}O^{16}S^{32}$.....	0.732 ±.007	M Stark		.....	49.0 Strandberg
	$C^{13}O^{16}S^{32}$.....	0.722 ±.007	M Stark		.....	49.0 Strandberg
	$C^{12}O^{16}S^{32}$.....	0.709[n] ±.004	M Stark		.....	50.0 Shulman
	$C^{12}O^{16}S^{34}$.....	([m])	.....		.....	50.0 Shulman
	$C^{12}O^{16}S^{32}$.....	0.712 ±.004	M Stark		.....	51.2 Shoolery
COSe	Carbonyl selenide.....	0.754[o]	M Stark		.....	49.1 Strandberg
CS_2	Carbon disulfide.....	0	22.36	$(20.37_\infty)_L$	325-489	30 Zahn
						[30 Schwingel]
						[36 Niini]
$CHBrF_2$	Bromodifluoromethane.....	1.50	.....	$(14.4)_\Sigma$	300	38 Fuoss
$CHClF_2$	Chlorodifluoromethane.....	1.409 ±.003	14.9 ±.1		304-479	33.1 Smyth
		1.48	.....	$(11.5)_\Sigma$	298	38 Fuoss

[i] H. Huxley and H. Lowery, Proc. Roy. Soc. (London) A182, 207 (1943). [j] $\mu = 0.45$ if $A = 15.7$. [k] $\mu = 0.56$ if $A = 20.0$. [l] $\mu = 0.53$ if $A = 23.9$. [m] Moments of $C^{13}O^{16}S^{32}$ and $C^{12}O^{16}S^{34}$ reported to be the same within 0.2%. [n] $\mu = 0.700 \pm 0.004$ for the excited vibrational state, $v_2 = 1$. [o] For the first excited vibrational states, $\mu = 0.728$ (stretching) and 0.730 (bending).

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_1—Con.					
$CHCl_2F$	Dichlorofluoromethane.....	1.293 ±.006	17.2 ±.3		305-424	33.1 Smyth
		1.41	.....	$(16.5)_\Sigma$	303	38 Fuoss
$CHCl_3$	Chloroform.....	1.02	24.8	$(21.0_\infty)_L$	298; 368	36 Ramaswamy
		1.013 ±.001	25.28 ±.05	21.4	301-427	41 Maryott
						[26 Sanger]
						[28 Sircir]
CHF_3	Fluoroform.....	1.60	8.8	6.98_∞	193-368	35 Ramaswamy
		1.645 ±.009	M Stark		.....	51.2 Shoolery
CHN	Hydrogen cyanide.....	2.91 ±.05	11.8 ±5.3		292-424	31 Braune
		2.95 ±.01	6.2 ±1.2		301-470	34.0 Smyth
		3.00	.....	$(6.3)_T$	298; 368	36 Watson
		2.957[y] ±.025	M Stark		.....	50.2 Shulman
						[30 Fredenhagen]
CHNO	Isocyanic acid.....	1.592[p] ±.015	M Stark		.....	51.0 Shoolery
CDNO	Isocyanic acid-*d*.....	1.619[p] ±.015	M Stark		.....	51.0 Shoolery
CHNS	Isothiocyanic acid.....	1.72[q]	M Stark		.....	50 Beard
CH_2Br_2	Dibromomethane.....	1.43 ±.03	23.5 ±1.3	$(20.7_\infty)_L$	338-427	41 Maryott
						[28 Mahanti]
CH_2ClNO_2	Chloronitromethane.....	2.91	.....	17.4	412-484	42.1 Hurdis
CH_2Cl_2	Dichloromethane.....	1.54	18.7	$(16.0_\infty)_L$	297; 368	36 Ramaswamy
		1.57 ±.01	20.0 ±.7	16.6	301-427	41 Maryott
						[26 Sanger]
						[28 Mahanti]
						[36 Niini]
CH_2F_2	Difluoromethane.....	1.93	M Stark		.....	52 Lide
CH_2O	Formaldehyde.....	2.27	.....	7.0	420-520	43 Hurdis
		2.17 ±.02	M Stark		.....	49 Bragg
		2.34 ±.02	M Stark		.....	51.2 Shoolery
CH_2O_2	Formic acid.....	1.52	.....	8.5	345-423	31.0 Zahn
		ca 1.4	.....		310-347	38.2 Coop
	Dimer ($C_2H_4O_4$).....	0	32		310-347	38.2 Coop
CH_3Br	Bromomethane.....	1.80 ±.02	15.2 ±1.1		306-406	34.1 Smyth
		1.81	.....	$(14.6)_\Sigma$	297; 368	36 Ramaswamy
		1.76 ±.04	17.8 ±1.3		291-416	37.0 Groves
		1.797 ±.015	M Stark		.....	50.1 Shulman
						[35 Mahanti]
CH_3Cl	Chloromethane.....	1.87 ±.01	13.5 ±.5	$(11.2_\infty)_L$	290-456	30 Fuchs
		1.87 ±.01	14.1 ±.5		298-418	32 Sanger

[p] For the dipole component along the NCO axis.
[q] For the dipole component along the SCN axis.
[y] For the excited vibrational state, $v_2 = 1$.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_1—Con.					
CH_3Cl	Chloromethane (Con.).....	1.89	.....	$(11.7)_\Sigma$	296; 368	36 Ramaswamy
		1.87 ±.03	M Stark		.....	49 Karplus
		1.869 ±.010	M Stark		.....	50.1 Shulman
						[28 Sircir]
						[35 Mahanti]
CH_3F	Fluoromethane.....	1.81 ±.01	9.6 ±.6	$(6.7)_\Sigma$	224-498	34.1 Smyth
		1.85	7.2		193-368	36 Ramaswamy
CH_3I	Iodomethane.....	1.60 ±.01	20.1 ±.5		305-494	34.1 Smyth
		1.62	.....	$(19.3)_L$	301; 368	36 Ramaswamy
		1.67	.....		295; 337	37.0 Groves
		1.647 ±.014	M Stark		.....	50.1 Shulman
						[35 Mahanti]
CH_3NO	Formamide.....	3.25	.....	10.6	425-449	32.0 Zahn
CH_3NO_2	Nitromethane.....	3.44 ±.01	18.6 ±.7		339-494	34.0 Smyth
		3.57	.....	12.5	373-470	37.0 Groves
CH_4	Methane.....	0	6.53	6.45_∞	193; 298	34 Watson
						[26 Sanger]
						[33 Uhlig]
CH_4O	Methanol.....	1.70 ±.01	7.8 ±.6	$(8.2)_L$	345-502	29 Miles
		1.70 ±.01	9.7 ±.4		308-482	35.0 Kubo
		1.70	8.1		302; 368	36 Ramaswamy
		1.706 ±.004	7.6 ±.2		298-479	38 Stranathan
CH_5N	Methyl amine.....	1.24 ±.03	13.4 ±1.0	10.3	338-458	32 Sanger
		1.26	13.7		298; 368	36 Ramaswamy
		1.35 ±.04	9.7 ±1.6		288-417	37.1 Groves
		1.30 ±.01	10.6 ±.5		293-420	47 Le Fevre
						[31 Ghosh]
CH_6Si	Methyl silane.....	0.73	M Stark		.....	50 Lide
CH_6Sn	Methyl stannane.....	0.68 ±.03	M Stark		.....	51 Lide
	C_2					
C_2ClF_5	Chloropentafluoroethane...	0.80	.....	$(15.8)_\Sigma$	300	38 Fuoss
$C_2Cl_2F_4$	1,2-Dichlorotetrafluoroethane.....	0.80	.....	$(21.5)_L$	299	38 Fuoss
C_2F_6	Hexafluoroethane.....	0	17.2	$(10.8)_\Sigma$	296	38 Fuoss
C_2N_2	Cyanogen.....	0	20.1	11.9_∞	239; 298	36 Watson
						[31 Braune]
C_2HBr	Bromoacetylene.....	0.0[e]	18.64	$(17.2)_\Sigma$	289-354	38 Brockway

[e] Although the structure is not symmetrical, the dipole moment appears to be virtually zero.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_2—Con.					
C_2HCl	Chloroacetylene.....	0.446 ±.005	15.3 ±.1	$(14.3)_{\Sigma}$	287-363	38 Brockway
		0.44 ±.01	M Stark		.....	49 Westenberg
C_2HCl_5	Pentachloroethane.....	0.95 ±.03	35.4 ±.8	$(35.6)_L$	400-517	49 Thomas
C_2H_2	Acetylene.....	0	9.97		196-461	25 Smyth
		0	9.84	8.58_{∞}	193; 298	34 Watson
$C_2H_2Cl_2$	*cis*-Dichloroethylene.....	1.90 ±.02	19.9 ±1.6	$(20.3)_T$	301-427	41 Maryott
$C_2H_2Cl_2F_2$	1,1-Dichloro-2,2-difluoroethane.....	1.34	.....	21.2	334	52 Smyth
		1.35	.....		345	
		1.36	.....		357	
		1.39	.....		384	
		1.40	.....		395	
		1.44	.....		428	
		1.45	.....		455	
		1.47	.....		474	
$C_2H_2Cl_2O$	Chloroacetyl chloride.....	2.23 ±.06	22.5 ±3.7	21.8	358-529	32.1 Zahn
$C_2H_2Cl_3F$	1,2,2-Trichloro-1-fluoroethane.....	1.38	.....	25.7	379	52 Smyth
		1.41	.....		417	
		1.42	.....		442	
		1.44	.....		475	
		1.44	.....		512	
$C_2H_2Cl_4$	1,1,2,2-Tetrachloroethane	1.36	.....	$(30.6)_L$	401-436	35.0 Smyth
		1.32 ±.03	32.4 ±1.2		378-501	47 Thomas
$C_2H_2F_2$	1,1-Difluoroethylene.....	1.37 ±.02	M Stark		.....	49 Roberts
C_2H_2O	Ketene.....	1.45	.....	11.0	398-446	46.3 Hannay
		1.414 ±.010	M Stark		.....	51 Johnson
C_2HDO	Ketene-*d*.....	1.423 ±.015	M Stark		.....	51 Johnson
C_2D_2O	Ketene-d_2.....	1.442 ±.013	M Stark		.....	51 Johnson
C_2H_3Br	Bromoethylene.....	1.415 ±.001	19.14 ±.06	18.5	295-413	38 Hugill
C_2H_3Cl	Chloroethylene.....	1.449 ±.003	16.18 ±.12	15.6	287-413	38 Hugill
$C_2H_3ClF_2$	1-Chloro-1,1-difluoroethane.....	2.21	.....	$(16.1)_{\Sigma}$	300	38 Fuoss
		2.14	20.3		357-507	52 Smyth
C_2H_3ClO	Acetyl chloride.....	2.72 ±.04	16.7 ±3.7	16.8	320-483	32.1 Zahn
$C_2H_3ClO_2$	Methyl chloroformate.....	2.41	.....	$(17.9)_{\Sigma}$	308	38 Mizushima
		2.43	.....		351	
		2.31	.....		413	
		1.55	.....		481	

Substance		$\mu \times 10^{18}$esu	A	R	Temperature (°K)	Reference
	C_2—Con.					
$C_2H_3Cl_3$	1,1,1-Trichloroethane.....	1.79 ±.02	27.0 ±1.0		301-395	41 Maryott
		1.77	.....	26.1	336-399	41.1 Wiswall
	1,1,2-Trichloroethane.....	1.22 ±.02	33.3 ±.6		340-517	49 Thomas
$C_2H_3F_3$	1,1,1-Trifluoroethane.....	2.35	.....	$(11.1)_\Sigma$	298	38 Fuoss
		2.321 ±.034	M Stark		.....	50.1 Shulman
C_2H_3I	Iodoethylene.....	1.30	.....	23.5	290-413	38 Hugill
C_2H_3N	Acetonitrile.....	3.84	.....	$(11.1)_L$	298;368	36 Ramaswamy
		3.96 ±.03	11.1 ±3.1		354-463	37.0 Groves
		3.97	M Stark		.....	50 Coles
C_2H_4	Ethylene.....	0	10.79		237-461	25 Smyth
		0	10.74	10.34∞	193;298	34 Watson
C_2H_4BrCl	1-Bromo-2-chloroethane....	1.16	.....	24.0	339	32.3 Zahn
		1.21	.....		368	
		1.35	.....		436	
$C_2H_4Br_2$	1,2-Dibromoethane.....	1.02	.....	27.0	339	32.3 Zahn
		1.07	.....		368	
		1.12	.....		405	
		1.19	.....		436	
		0.97	.....	(27.0)	357	40.0 Linke
		1.06	.....		374	
		1.14	.....		419	
		1.17	.....		458	
		1.23	.....		509	
		1.26	.....		531	
		0.91	.....	(27.0)	339	41 Bloom
		0.97	.....		369	[32 Greene]
		1.04	.....		408	
		1.10	.....		437	
		1.14	.....		467	
		1.19	.....		496	
C_2H_4ClF	1-Chloro-2-fluoroethane...	1.84	.....	$(16.4)_\Sigma$	309	52 Smyth
		1.86	.....		329	
		1.91	.....		371	
		1.97	.....		418	
		1.97	.....		481	
		1.97	.....		506	
$C_2H_4ClNO_2$	1-Chloro-1-nitroethane....	3.27 ±.05	27.5 ±4.5	21.9	415-468	42.1 Hurdis
$C_2H_4Cl_2$	1,1-Dichloroethane.....	2.06 ±.02	21.8 ±1.4	21.2	301-427	41 Maryott
						[29.0 Ghosh]

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_2—Con.					
$C_2H_4Cl_2$	1,2-Dichloroethane.....	1.19	.....	$(21.0)_L$	305	31.1 Zahn
		1.32	.....		341	
		1.39	.....		376	
		1.48	.....		419	
		1.54	.....		456	
		1.56	.....		485	
		1.63	.....		544	
		1.28	.....	$(21.0)_L$	334	32 Sanger
		1.54	.....		453	
		1.24	.....	$(21.0)_L$	308	41 Bloom
		1.31	.....		335	
		1.39	.....		372	
		1.45	.....		406	
		1.51	.....		441	
		1.56	.....		481	
		1.60	.....		525	
		1.24	.....	$(21.0)_L$	307	42 Watanabe
		1.33	.....		353	[29.0 Ghosh]
		1.42	.....		385	[32 Greene]
		1.46	.....		412	
C_2H_4O	Ethylene oxide.....	1.90	11.4	$(10.9)_\Sigma$	290-449	28 Stuart
		1.91	.....		297;368	36 Ramaswamy
		1.88 ±.01	M Stark		.....	51 Cunningham
	Acetaldehyde.....	2.72	.....	11.6	300-455	32.1 Zahn
		2.72	.....		420;469	43 Hurdis
$C_2H_4O_2$	Acetic acid.....	1.74	.....	12.9	450-494	31.0 Zahn
C_2H_4S	Ethylene sulfide.....	1.84 ±.02	M Stark		.....	51 Cunningham
C_2H_5Br	Bromoethane.....	2.03 ±.01	21.2 ±.4	$(18.3_\infty)_L$	303-441	34.1 Smyth
		2.02 ±.04	20.3 ±2.5	19.1	292-443	37.0 Groves
						[35 Mahanti]
						[36 Niini]
C_2H_5Cl	Chloroethane.....	2.06	17.8		292-455	30 Fuchs
		2.03 ±.03	20.9 ±2.7		298-418	32 Sanger
		2.07	.....	$(16.3)_\Sigma$	296;368	36 Ramaswamy
		1.98	.....		292;359	48 Jelatis
						[28 Sircir]
						[36 Niini]
C_2H_5ClO	2-Chloroethanol.....	1.78	.....	17.8	339-435	32.0 Zahn
	Chloromethoxymethane.....	2.03	.....	$(18.0)_\Sigma$	347-507	52 Smyth

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_2—Con.					
C_2H_5F	Fluoroethane.....	1.92 ±.01	12.5 ±.7	$(11.3)_{\Sigma}$	236-535	34.1 Smyth
C_2H_5I	Iodoethane.....	1.92 ±.03	25.3 ±1.9		348-463	34.1 Smyth
		1.90	.....	24.3	293; 337	37.0 Groves
						[35 Mahanti]
						[36 Niini]
$C_2H_5NO_2$	Nitroethane.....	3.54 ±.02	24.3 ±2.3	17.0	365-461	37.0 Groves
		3.70 ±.04	15.9 ±4.2		398-484	42.1 Hurdis
	Ethyl nitrite.....	2.38	.....	$(17.9)_L$	290	34 Czerlinsky
C_2H_6	Ethane.....	0	11.21		200-470	25 Smyth
		0	11.15	11.07_{∞}	193; 298	34 Watson
C_2H_6AlCl	Dimethylaluminum chloride[r]					41.0 Wiswall
C_2H_6O	Methyl ether.....	1.30	15.1		292-453	28 Stuart
		1.30 ±.02	15.4 ±.8		298-418	32 Sanger
		1.29	15.0		297; 369	36 Ramaswamy
		1.31 ±.04	13.4 ±2.0	13.3	290-428	37.1 Groves
	Ethanol.....	1.69	.....	$(12.8)_L$	351-499	29 Miles
		1.70 ±.01	13.0 ±.4		298-450	32 Knowles
		1.68 ±.02	14.3 ±1.3		308-483	35.0 Kubo
$C_2H_6O_2$	Ethylene glycol.....	2.28	.....	14.4	417-506	32.0 Zahn
$C_2H_6O_2S$	Dimethyl sulfone.....	4.49	.....	18.3_{546}	424-526	39 Coop
C_2H_6S	Ethanethiol.....	1.58 ±.00	18.7 ±.1	$(19.2)_T$	308-478	36.0 Kubo
C_2H_7N	Ethyl amine.....	1.22 ±.02	17.9 ±.8	14.7	303-447	50 Barclay
						[31 Ghosh]
	Dimethyl amine.....	0.97 ±.01	17.4 ±.3	15.1	298-418	32 Sanger
		1.03	15.8		288-427	37.1 Groves
		1.03 ±.01	15.0 ±.5		292-440	47 LeFevre
						[31 Ghosh]
$C_2H_8N_2$	Ethylene diamine.....	1.99	.....	$(18.2)_L$	355; 429	32.0 Zahn
	C_3					
C_3HF_3	3,3,3-Trifluoropropyne....	2.36 ±.04	M Stark		.....	51 Shoolery
C_3HN	Cyanoacetylene.....	3.6 ±.2	M Stark		.....	50 Westenberg
C_3H_3N	Acrylonitrile.....	3.83 ±.01	20.3 ±1.5	15.6	387-509	43 Hurdis
C_3H_4	Propyne.....	0.72	15.6	14.0_{∞}	298; 368	36 Watson
		0.78	.....	14.0	298; 348	38 Krieger
		0.75 ±.01	M Stark		.....	52 Ghosh
	1,2-Propanediene.....	0	16.6	15.1_{∞}	298; 368	36 Watson

[r] No reliable value of the dipole moment could be obtained because of molecular association.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_3—Con.					
$C_3H_4Cl_2$	1,3-Dichloropropene[s] (b.p. 104°)	1.79	.....	25.4	397-478	49 Oriani
	1,3-Dichloropropene[s] (b.p. 112°)	1.81	.....	25.5	395-503	49 Oriani
	2,3-Dichloropropene	1.74	.....	25.5	397	49 Oriani
		1.77	.....		518	
C_3H_4O	Propenal (Acrolein)	3.04	.....	16.1	377-478	46.3 Hannay
C_3H_5Cl	*cis*-1-Chloro-1-propene	1.71	.....	20.4	345-476	46.2 Hannay
	trans-1-Chloro-1-propene	1.97	.....	20.4	345-476	46.2 Hannay
	2-Chloro-1-propene	1.66 ±.02	21.8 ±1.1	20.4	339-469	46.2 Hannay
	3-Chloro-1-propene (Allyl chloride)	1.90 ±.01	20.1 ±.8		308-480	37.0 Kubo
		1.98	.....	20.4	377-480	46.2 Hannay
						[35 Mahanti]
C_3H_5ClO	Chloroacetone	2.21	.....	21.2	336	32.1 Zahn
		2.22	.....		379	
		2.24	.....		414	
		2.29	.....		454	
$C_3H_5ClO_2$	Ethyl chloroformate	2.59	.....	$(22.6)_\Sigma$	308	38 Mizushima
		2.50	.....		350	
		1.82	.....		411	
		1.47	.....		480	
C_3H_5N	Propionitrile	4.05 ±.04	16.9 ±4.7		351-469	37.0 Groves
		4.00	.....	15.8	395-477	43 Hurdis
C_3H_6	Cyclopropane	0	14.28	$(13.9)_\Sigma$	297; 368	36 Ramaswamy
	Propene	0.35 ±.01	15.7 ±.1		246-476	33 McAlpine
		0.34	15.9	15.2_∞	193-298	34 Watson
$C_3H_6ClNO_2$	1-Chloro-1-nitropropane	3.52	.....	26.3	416-493	42.1 Hurdis
$C_3H_6Cl_2$	1,2-Dichloropropane	1.46	.....	25.6	345	49 Oriani
		1.53	.....		394	
		1.63	.....		466	
		1.68	.....		506	
	1,3-Dichloropropane	2.08 ±.02	27.4 ±.9	$(25.8)_\Sigma$	374-485	35.0 Smyth
	2,2-Dichloropropane	2.27	.....	25.8	300-372	41 Maryott
C_3H_6O	Allyl alcohol	1.60 ±.04	19.3 ±1.9	$(17.0)_L$	329-479	35.1 Kubo
	Propionaldehyde	2.72 ±.03	16.4 ±2.2	16.0	354-509	43 Hurdis
	Acetone	2.89	.....		292-456	28 Stuart
		2.88	.....	16.2	301-455	32.1 Zahn
		2.87	.....		298; 368	36 Ramaswamy
						[36 Niini]

[s] *cis-trans* Isomers.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_3—Con.					
$C_3H_6O_2$	Propionic acid.....	1.75	.....	17.4	430-486	31.0 Zahn
	Ethyl formate.....	1.93 ±.03	20.2 ±2.0	17.8	292-435	32.2 Zahn
	Methyl acetate.....	1.72	.....	17.6	327-517	32.2 Zahn
		1.72 ±.02	17.5 ±.9		308-482	38 Mizushima
$C_3H_6O_3$	Dimethyl carbonate.....	0.90	.....	$(19.4)_\Sigma$	328	37.1 Kubo
		.93	.....		350	
		.98	.....		412	
		1.05	.....		479	
	Trioxane.....	2.08 ±.01	M Stark		.....	51 Amble
C_3H_7Br	1-Bromopropane.....	2.18	.....	23.7	348-441	37.0 Groves
						[35 Mahanti]
	2-Bromopropane.....	2.21	.....	24.1	287-380	37.0 Groves
C_3H_7Cl	1-Chloropropane.....	2.05 ±.01	25.3 ±.6	20.8	338-458	32 Sanger
						[35 Mahanti]
						[36 Niini]
	2-Chloropropane.....	2.17	.....	$(21.1)_T$	288-383	37.0 Groves
C_3H_7I	1-Iodopropane.....	2.04	.....	28.9	337;374	37.0 Groves
						[35 Mahanti]
$C_3H_7NO_2$	1-Nitropropane.....	3.60	.....	21.4	343-466	37.0 Groves
		3.72	.....		382-457	41.1 Wiswall
	2-Nitropropane.....	3.73	.....	21.6	392-455	41.1 Wiswall
C_3H_8	Propane.....	0	16.07		227-486	33 McAlpine
		0	16.05	15.73_∞	240;298	34 Watson
C_3H_8O	Methoxyethane.....	1.23 ±.02	20.0 ±.7	17.7	303-369	49 Moore
	1-Propanol.....	1.69 ±.03	16.6 ±1.6	$(17.4)_L$	376-505	29 Miles
		1.67 ±.05	17.4 ±2.6		308-481	35.1 Kubo
	2-Propanol.....	1.60 ±.03	20.7 ±1.6	$(17.5)_L$	307-482	35.0 Kubo
		1.69 ±.02	17.7 ±1.1		289-468	37 Stranathan
$C_3H_8O_2$	Dimethoxymethane (Methyal)	0.77	.....	$(19.3)_L$	307	36.1 Kubo
		0.87	.....		352	
		1.00	.....		407	
		1.17	.....		482	
C_3H_9Al	Trimethyl aluminum[r].....				360-398	41.0 Wiswall
C_3H_9N	*n*-Propylamine.....	1.17 ±.02	23.2 ±.6	19.4	334-432	51 Barclay
C_3H_9N	Trimethylamine.....	0.61 ±.03	21.5 ±.6		338-458	32 Sanger
		0.67	20.2	19.4	289-418	37.1 Groves
		0.65 ±.01	20.0 ±.3		294-441	47 LeFevre
						[31 Ghosh]

[r] No reliable value of the dipole moment could be obtained because of molecular association.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_4					
$C_4H_2N_2$	Fumaronitrile.....	0	29.7	19.8_{546}	410	41 Bloom
$C_4H_4N_2$	Succinonitrile.....	3.47	.....	$(20.4)_L$	443	41 Bloom
		3.54	.....		478	
		3.59	.....		513	
C_4H_4O	Furan.....	0.661 ±.006	M Stark		.....	51 Sirvetz
$C_4H_4O_2$	Diketene.....	3.53	.....	20.1	433-516	43 Hurdis
C_4H_4S	Thiophene.....	0.56 ±.06	24.4 ±1.1	$(24.3)_L$	329-474	36.0 Kubo
C_4H_5Cl	4-Chloro-1,2-butadiene....	2.02	.....	25.3	394-491	46.2 Hannay
C_4H_5N	Methacrylonitrile.....	3.69	.....	20.2	395-473	46.3 Hannay
	trans-Crotononitrile.....	4.50	.....	20.8	409-516	43 Hurdis
C_4H_6	1-Butyne.....	0.80	.....	18.7	298-398	38 Krieger
	1,3-Butadiene.....	0	21.8	21.6	299-462	43 Hannay
C_4H_6O	Crotonaldehyde.....	3.67	.....	21.5	412-519	43 Hurdis
	Methacrylaldehyde (Methacrolein).....	2.68	.....	21.0	366-466	46.3 Hannay
$C_4H_6O_2$	Biacetyl.....	1.30	.....	20.6	329	32.3 Zahn
		1.35	.....		359	
		1.39	.....		391	
		1.43	.....		426	
		1.48	.....		461	
		1.55	.....		504	
		1.10	.....	20.6	328	41 Bloom
		1.17	.....		362	
		1.23	.....		398	
		1.29	.....		438	
		1.34	.....		478	
$C_4H_6O_3$	Acetic anhydride.....	ca 2.8	.....	$(22.4)_L$	320-540	33.1 Zahn
C_4H_6S	Divinyl sulfide.....	1.20	.....	27.6	400-461	46.2 Hannay
C_4H_7Cl	1-Chloro-2-methylpropene (Isocrotyl chloride).....	1.95 ±.03	27.2 ±1.8	25.0	358-523	43 Hurdis
	3-Chloro-2-methyl-1-propene (Methallyl chloride).....	1.85	.....	25.1	377-477	46.2 Hannay
C_4H_7N	Butyronitrile.....	4.07	.....	21.2	339-443	37.0 Groves
C_4H_8	1-Butene.....	0.38 ±.01	20.1 ±.2		274-466	25 Smyth
		0.30	21.5	19.74_∞	298;368	36 Watson
	trans-2-Butene.....	0	21.42	19.85_∞	298;368	36 Watson
	2-Methylpropene.....	0.49	20.9	19.85_∞	298;368	36 Watson
$C_4H_8Cl_2$	1,4-Dichlorobutane.....	2.22	.....	30.3	433-507	49 Oriani
C_4H_8O	Butyraldehyde.....	2.72	.....	20.6	354-412	43 Hurdis

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_4—Con.					
$C_4H_8O_2$	Ethyl acetate.....	1.78 ±.00	24.4 ±.2	22.3	302-467	32.2 Zahn
	1,4-Dioxane.....	0	24.5	$(21.6)_L$	337-487	34 Schwingel
		0	26.0		329-479	36.3 Kubo
C_4H_9Br	1-Bromobutane.....	2.08 ±.05	35.0 ±3.3	28.3	352-474	37.0 Groves
	2-Bromobutane.....	2.23	.....	28.4	343	37.0 Groves
C_4H_9Cl	1-Chlorobutane.....	2.05 ±.01	28.6 ±.6		315-480	35.1 Smyth
		2.14	.....	25.4	288-375	37.0 Groves
	1-Chloro-2-methylpropane..	2.00 ±.07	28.0 ±4.9	25.4	345-407	41.1 Wiswall
	2-Chloro-2-methylpropane..	2.13	.....	25.9	314-354	41.1 Wiswall
	2-Chlorobutane.....	2.04 ±.05	31.2 ±3.3	25.7	336-392	41.1 Wiswall
C_4H_9I	1-Iodobutane.....	2.12	.....	33.5	349;415	37.0 Groves
$C_4H_9NO_2$	1-Nitrobutane.....	3.59	.....	26.2	373-470	37.0 Groves
	2-Methyl-2-nitropropane...	3.71	.....	26.1	379-449	41.1 Wiswall
C_4H_{10}	*n*-Butane.....	0	20.68	20.20_∞	298;368	36 Watson
	2-Methylpropane.....	0	20.87	20.18_∞	298;368	36 Watson
$C_4H_{10}O$	Ethyl ether.....	1.15 ±.00	25.8 ±.2	$(22.1_\infty)_L$	289-455	28 Stuart
		1.11 ±.02	27.6 ±.7		313-433	32 Sanger
		1.19 ±.01	23.3 ±.5	22.5	288-476	37.1 Groves
		1.13 ±.01	26.0 ±.3		303-371	49 Moore
						[30 Fuchs]
						[36 Niini]
						[40 Hobbs]
	1-Butanol.....	1.67 ±.02	21.9 ±.7	$(22.1)_L$	385-490	29 Miles
		1.65 ±.08	22.9 ±4.3		329-481	35.1 Kubo
	2-Methylpropanol.....	1.64 ±.01	22.5 ±.6	$(22.2)_L$	328-481	35.0 Kubo
$C_4H_{10}S$	Ethyl sulfide.....	1.54 ±.05	27.2 ±2.6	$(28.5)_L$	308-474	36.0 Kubo
$C_4H_{11}N$	*n*-Butylamine.....	1.00 ±.06	34.1[x] ±2.2	24.5	350-433	51 Barclay
	Diethylamine.....	0.92 ±.03	25.7 ±1.0	24.3	334-413	50 Barclay
						[31 Ghosh]
	C_5					
C_5H_5N	4-Cyano-1,3-butadiene.....	3.90	.....	26.4	427-464	46.3 Hannay
C_5H_6	1,3-Cyclopentadiene.....	0.53	.....	21.8	344-452	46.1 Hannay
C_5H_8	1-Pentyne.....	0.86	.....	23.0	298-398	38 Krieger
	trans-1,3-Pentadiene.....	0.68	.....	25.3	389-469	43 Hannay
	2-Methyl-1,3-butadiene (Isoprene).....	0.38	.....	25.2	358-477	43 Hannay
$C_5H_8O_2$	Acetyl acetone.....	3.05	.....	26.4	322-477	33.1 Zahn

[x] The unexpectedly large difference between A and R, as compared to other amines, suggests that the listed value of the dipole moment may be somewhat too low.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_5—Con.					
C_5H_9N	Valeronitrile.....	4.12 ±.03	26.2 ±3.5	25.2	423-522	35 Groves
$C_5H_{10}O_3$	Diethyl carbonate.....	1.10 ±.03	28.6 ±.9	28.6	352-477	36.2 Kubo
$C_5H_{11}Br$	1-Bromopentane.....	2.20	.....	$(33.1)_{\sum}$	392;484	32 Smyth
$C_5H_{11}Cl$	1-Chloropentane.....	2.16	.....	30.3	351;381	37.0 Groves
C_5H_{12}	Pentane.....	0	25.2	$(24.3_{\infty})_L$	307-384	35.0 Kubo
$C_5H_{12}O_2$	Diethoxyethane (Ethylal)..	1.26[t]	.....	$(28.6)_T$	329	36.2 Kubo
		1.27	.....		352	
		1.32	.....		409	
		1.32	.....		476	
$C_5H_{12}O_4$	Tetramethyl orthocarbonate $[C(OCH_3)_4]$.....	0.89	.....	32	374	30 Fuchs
		1.00	.....		456	
	C_6					
$C_6H_2Cl_2O_2$	2,5-Dichloro-1,4-benzoquinone.....	0	46.3	38.4_{546}	454;518	38.0 Coop
C_6H_4BrF	*p*-Bromofluorobenzene.....	0.53[u]	.....	33.7	436-524	42.0 Hurdis
$C_6H_4ClNO_2$	*o*-Chloronitrobenzene.....	4.64	.....	36.9	477	37.2 Groves
	m-Chloronitrobenzene.....	3.73	.....	36.9	483	37.2 Groves
	p-Chloronitrobenzene.....	2.83	.....	36.9	483	37.2 Groves
$C_6H_4Cl_2$	*o*-Dichlorobenzene.....	2.52 ±.03	35.2 ±1.8		445-523	42.0 Hurdis
		2.48	.....	35.9	354-424	49 Moore
						[37.2 Groves]
	m-Dichlorobenzene.....	1.72	.....	36.0	413;458	37.2 Groves
	p-Dichlorobenzene.....	0	38.1	36.0	434	37.2 Groves
C_6H_4FI	*p*-Fluoroiodobenzene.....	0.89	.....	39.2	470;492	42.0 Hurdis
$C_6H_4FNO_2$	*p*-Fluoronitrobenzene.....	2.87	.....	32.4	488-524	42.0 Hurdis
$C_6H_4F_2$	*m*-Difluorobenzene.....	1.62	.....	25.9	353-423	49 Moore
$C_6H_4N_2O_4$	*p*-Dinitrobenzene.....	0	46.5	38.3	473-528	38.0 Coop
$C_6H_4O_2$	*p*-Benzoquinone.....	0	36.6	28.3_{546}	393-520	38.0 Coop
C_6H_5Br	Bromobenzene.....	1.70 ±.01	37.2 ±.6		374-483	35 Groves
		1.77	.....	34.0	456	42.0 Hurdis
C_6H_5Cl	Chlorobenzene.....	1.70 ±.04	34.7 ±2.1		360-495	34 Groves
		1.71 ±.01	31.5 ±.7		374-518	35 McAlpine
		1.72	.....	31.1	436	42.0 Hurdis
		1.67 ±.05	35.6 ±2.4		354-427	49 Moore

[t] Alternatively, $P = 34.7 \pm 2.5 + \frac{7{,}719 \pm 970}{T}$ and $\mu = 1.13 \pm 0.07$.

[u] Alternatively, $P = 36.4 \pm 1.1 + \frac{462 \pm 520}{T}$ and $\mu = 0.28$.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_6—Con.					
C_6H_5ClO	*o*-Chlorophenol.....	1.24	.....	$(32.7)_\Sigma$	421	40.1 Linke
		1.30	.....		492	
		1.37	.....		563	
	p-Chlorophenol.....	2.11	.....	$(32.7)_\Sigma$	430-550	40.1 Linke
C_6H_5F	Fluorobenzene.....	1.58 ±.02	26.0 ±.9		344-507	35 McAlpine
		1.60	.....	26.0	351-423	49 Moore
C_6H_5I	Iodobenzene.....	1.70	.....	39.2	433-487	42.0 Hurdis
$C_6H_5NO_2$	Nitrobenzene.....	4.27	.....	$(32.7)_L$	402-523	34 Groves
		4.22 ±.05	37.2 ±5.4		442-549	35 McAlpine
C_6H_6	Benzene.....	0	26.9	$(26.2)_L$	326-480	33 McAlpine
		0	26.2		346-522	34 Groves
		0	27.1		296;368	36 Ramaswamy
		0	27.1		413	42.1 Hurdis
C_6H_6O	Phenol.....	1.45	.....	28.0	450	37.2 Groves
C_6H_7N	Aniline.....	1.53	.....	30.6	459	37.2 Groves
$C_6H_8N_2$	*o*-Phenylenediamine.....	1.53	.....	$(34.9)_\Sigma$	506-596	40.1 Linke
	m-Phenylenediamine.....	1.81	.....	$(34.9)_\Sigma$	504;556	40.1 Linke
	p-Phenylenediamine.....	1.53	.....	$(34.9)_\Sigma$	505;564	40.1 Linke
C_6H_{10}	1-Hexyne.....	0.89	.....	27.6	298-398	38 Krieger
	2-Ethyl-1,3-butadiene.....	0.45	.....	29.8	384-479	46.1 Hannay
	3-Methyl-1,3-pentadiene...	0.63	.....	29.8	399-487	46.1 Hannay
	2-Methyl-1,3-pentadiene...	0.65	.....	30.4	399-497	46.1 Hannay
	2,3-Dimethyl-1,3-butadiene	0.52	.....	29.8	371-484	43 Hannay
	Cyclohexene.....	0.55	.....	$(27.0)_T$	308-480	37.0 Kubo
$C_6H_{10}O_3$	Ethyl acetoacetate.....	2.98	.....	32.6	394-431	33.1 Zahn
$C_6H_{12}N_2$	Dimethylketazine.....	1.53 ±.01	39.3 ±.3	36	349-505	41 Bloom
$C_6H_{12}O_2$	Amyl formate.....	1.90 ±.03	35.8 ±1.9	31.8	376-516	32.2 Zahn
$C_6H_{12}O_3$	Paraldehyde.....	1.43 ±.04	45.2 ±1.5	33.1	386-473	50.1 Le Fevre
C_6H_{14}	*n*-Hexane.....	0	30.0		337-484	34.2 Smyth
		0	29.9	29.9	352;384	35.0 Kubo
$C_6H_{14}O$	Propyl ether.....	1.30	.....	31.7	368-448	32 Sanger
		1.21	32.3		331-473	37.1 Groves
$C_6H_{14}O_2$	1,1-Diethoxyethane (Acetal).....	1.11	.....	$(33.2)_\Sigma$	328	36.2 Kubo
		1.12	.....		352	
		1.13	.....		410	
		1.22	.....		476	
$C_6H_{15}N$	Triethylamine.....	0.66 ±.04	33.0 ±.8	33.1	373-453	50 Barclay [31 Ghosh]

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_7					
$C_7H_4N_2O_2$	*p*-Cyanonitrobenzene.....	ca 0	ca 47.5	38.6_{546}	482-524	38.0 Coop
C_7H_5N	Benzonitrile.....	4.42	.....	31.6	383-525	34 Groves
C_7H_7F	*o*-Fluorotoluene.....	1.37	.....	31.0	351-423	49 Moore
	m-Fluorotoluene.....	1.86	.....	31.0	363-423	49 Moore
	p-Fluorotoluene.....	2.00	.....	31.0	351-423	49 Moore
$C_7H_7NO_3$	*o*-Nitroanisole.....	4.83	.....	39.6	477	37.2 Groves
	m-Nitroanisole.....	4.55	.....	39.6	476	37.2 Groves
	p-Nitroanisole.....	5.26	.....	39.6	478	37.2 Groves
C_7H_8	Toluene.....	0.36 ±.03	32.2 ±.4	$(31.1)_L$	357-482	33 McAlpine
		0.36 ±.02	30.9 ±.2		349-456	39 Baker
C_7H_8O	Anisole.....	1.38	.....	$(33.0)_L$	403	37.2 Groves
C_7H_9NO	*o*-Ansidine.....	1.61	.....	$(35.9)_\Sigma$	464-571	40.1 Linke
C_7H_{12}	1-Heptyne.....	0.87	.....	32.3	348; 398	38 Krieger
C_7H_{14}	Methylcyclohexane.....	0	33.0	$(32.5)_L$	370; 456	39 Baker
$C_7H_{14}O$	Cyclohexyl methyl ether...	1.35	.....	33.9	406-473	37.2 Groves
$C_7H_{14}O_2$	Amyl acetate.....	1.75 ±.04	37.5 ±2.1	36.2	376-517	32.2 Zahn
$C_7H_{15}Br$	1-Bromoheptane.....	2.16	.....	42.3	373-434	35.1 Smyth
C_7H_{16}	*n*-Heptane.....	0	34.9	$(34.6)_T$	348-501	34.2 Smyth
		0	34.2		384	35.0 Kubo
	C_8					
$C_8H_4N_2$	*p*-Dicyanobenzene.....	0	48.4	36.5	473-524	38.0 Coop
C_8H_8	Styrene.....	ca 0	ca 37.6	36.4	442; 462	46.1 Hannay
C_8H_8O	Acetophenone.....	3.02 ±.02	37.9 ±1.7	36.3	410-493	35 Groves
$C_8H_8O_2$	2,5-Dimethyl-1,4-benzoquinone.....	0	47.4	38.4_{546}	415-519	38.0 Coop
C_8H_{10}	Ethylbenzene.....	0.59 ±.01	35.8 ±.1	$(35.7)_L$	349-455	39 Baker
	o-Xylene.....	0.62	37.7[v]	35.8	413-512	42.0 Hurdis
	p-Xylene.....	0	37.7	36.0	447	42.0 Hurdis
$C_8H_{10}O$	Phenetole.....	1.45	.....	37.6	415; 473	37.2 Groves
$C_8H_{11}N$	*N*-Dimethylaniline.....	1.68	.....	40.8	455	37.2 Groves
$C_8H_{12}O_2$	Ethyl sorbate.....	2.07	.....	43.3	507	46.3 Hannay
	Tetramethylcyclobutane-1,3-dione.....	0	46.9	37.7_{546}	363-423	38.0 Coop
$C_8H_{14}O_4$	Diethyl succinate.....	2.35	.....	42.3	430	32.0 Zahn
		2.38	.....		467	
		2.41	.....		519	
C_8H_{16}	Ethylcyclohexane.....	0	40.0	$(37.1)_L$	370; 456	39 Baker
C_8H_{18}	*n*-Octane.....	0	40.2	$(39.2)_L$	433	42.1 Hurdis
$C_8H_{18}O$	*n*-Butyl ether.....	1.17	43.4	40.8	385-455	37.1 Groves

[v] Assumed to be the same as for *p*-xylene.

Substance		$\mu \times 10^{18}$ esu	A	R	Temperature (°K)	Reference
	C_9					
$C_9H_{10}O_2$	Ethyl benzoate.....	2.00	.....	42.6	405-505	35 Groves
C_9H_{12}	Isopropylbenzene.....	0.79	.....	$(40.4)_L$	411;455	39 Baker
C_9H_{18}	Isopropylcyclohexane.....	0	43.3	$(41.6)_\Sigma$	391;456	39 Baker
	C_{10}					
$C_{10}H_{14}$	*t*-Butylbenzene.....	0.83	.....	45.0	456;477	39 Baker
$C_{10}H_{14}BeO_4$	Berylium acetylacetonate..	0	86.0	60.5_{546}	458-528	38.0 Coop
$C_{10}H_{20}$	*t*-Butylcyclohexane.....	0	49.9	$(46.2)_\Sigma$	411;456	39 Baker
	C_{11}					
$C_{11}H_{16}$	*p*-tert-Butyltoluene*.....				477	39 Baker
	C_{12}					
$C_{12}H_8Br_2O$	4,4'-Dibromodiphenyl ether	1.02	.....	70.0	517	38.1 Coop
$C_{12}H_9BrO$	4-Bromodiphenyl ether.....	1.98	.....	61.0	516	38.1 Coop
$C_{12}H_9NO_3$	4-Nitrodiphenyl ether.....	4.54	.....	62.2	499;516	38.1 Coop
$C_{12}H_{10}O$	Diphenyl ether.....	1.23	.....	52.8	444;483	38.1 Coop
		1.43	.....		486	37.2 Groves
	C_{13}					
$C_{13}H_{11}BrO$	*p*-Bromophenyl-*p*-tolyl ether	2.45	.....	67.1	502;518	38.1 Coop
	C_{14}					
$C_{14}H_{14}O$	Di-p-tolyl ether.....	1.54	.....	62.7	502	38.1 Coop
	C_{15}					
$C_{15}H_{21}AlO_6$	Aluminum acetylacetonate..	0	130.8	91.1_{546}	502;520	38.0 Coop
$C_{15}H_{21}CrO_6$	Chromium acetylacetonate..	0	135.5	95.3_{578}	509;520	38.0 Coop
$C_{15}H_{21}FeO_6$	Ferric acetylacetonate....	0	146.6	91.5_{546}	502	38.0 Coop
	C_{20}					
$C_{20}H_{28}O_8Th$	Thorium acetylacetonate...	0	200	127.5_{546}	511	38.0 Coop

* Data show anomalies which preclude a reliable determination of the molar polarization.

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