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Bibliography of Photon Total Cross Section (Attenuation Coefficient) Measurements 10 eV to 13.5 GeV

J. H. Hubbell, H. M. Gerstenberg, and E. B. Saloman

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Gaithersburg, MD 20899

July 1986

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Washington, DC 20545

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MEASUREMENTS 10 eV TO 13.5 GeV**

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U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

Bibliography of Photon Total Cross Section (Attenuation Coefficient)
Measurements 10 eV to 13.5 GeV^{*}

J.H. Hubbell, H.M. Gerstenberg, and E.B. Saloman

Photon and Charged Particle Data Center

Center for Radiation Research

National Bureau of Standards

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Abstract

We present a bibliography of papers reporting absolute measurements of photon (XUV, x-ray, gamma-ray, bremsstrahlung) total interaction cross sections or attenuation coefficients for the elements and some compounds. The energy range covered is from 10 eV to above 10 GeV. These papers are part of the reference collection of the National Bureau of Standards Photon and Charged Particle Data Center. They cover the period from 1907 to March 1986. Included with each reference are annotations specifying the substances studied and the energy range covered. The bibliography includes about 500 non-duplicative references to a total of about 20,000 data points. All these data are available in machine-readable form.

Key words: attenuation coefficient, cross section, bibliography,
data base, gamma rays, photons, x rays.

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1. Introduction

Since 1950 the National Bureau of Standards (NBS) has maintained a data base of measured and theoretical cross section data in the form of reprints, reports, and personal communications. The purpose is to provide photon (XUV, x-ray, gamma-ray, and bremsstrahlung) interaction data required in a variety of medical, industrial, defense, and scientific applications. This data base has been used from time to time for the tabulation of photon cross sections and attenuation coefficients [1-11]. We present a bibliography of the measured absolute photon interaction cross sections and attenuation coefficients contained in this data base.

2. Compilation of the Bibliography

The items included in the bibliography have been acquired from a variety of sources. The archival journals covered by Current Contents have been reviewed both for articles on attenuation coefficients and for articles in which attenuation coefficients have been measured incidentally to their main objective. We have drawn on previous review articles and bibliographies [12-22]. Also included are unpublished reports and private communications. In cases where there is multiple publication of essentially the same data only one reference is made. No attempt has been made to eliminate anomalous data sets from this listing. The dates of the items in the bibliography range from 1907 to March 1986. Table 1 is a summary of the number of items in this bibliography by decade of publication. There are a total of 512 separate references to a total of about 20,000 data points. All these data are available in machine-readable form.

3. Description of the Bibliography

This bibliography is an updated and enlarged version of the bibliography of reference 23. The six-character reference symbols are the same as those of reference 23. The first two characters are the last two digits of the year of publication (or report). The next two characters are the first two letters of the first author's last name. The final two digits (usually 01) are added to insure uniqueness. The references are arranged in increasing order of year of publication and within each year alphabetically by first author. For each item the reference symbol is at the left margin. Next comes a listing of all authors, the journal title, volume number, pagination and year (or alternate referencing if not a journal article). The title of the article is given on the lines following. On the last line, enclosed in parenthesis, is the photon energy range studied and a listing of the elements measured in order of increasing atomic number as well as a listing of any compounds measured. An index to materials covered, arranged by atomic number for elements, and alphabetically for compounds and for named substances, is provided.

4. Discussion

This bibliography has been prepared as part of a critical evaluation of photon absorption cross sections and includes references to all data sets which provide either absolute cross sections or can be converted into absolute cross sections. Not all the data represented by this bibliography are consistent. As can be seen in the graphs of reference 23, in a recent graphical intercomparison of Pb data by Gerstenberg [24] and in a forthcoming soft x-ray intercomparison by Saloman [25,26], some data sets appear to have substantial systematic errors as compared with the "main stream" of data points or with

"reliable" theory. Reference 26 provides both tabular and graphical comparisons for energies between 10 eV and 100 keV between the data covered in this bibliography, the semi-empirical cross section compilation of Henke et al. [13] and the theoretical photoionization values of Scofield [27].

5. Request for Additions and Corrections

Since we want the NBS data base to be as up-to-date, accurate, and comprehensive as possible, we would appreciate receiving any corrections and additions to this work. We would also appreciate receiving copies of any new papers containing photon absorption cross section data.

Acknowledgments

The authors wish to thank M.J. Berger for his stimulation and guidance of this work, Mrs. Gloria Wiersma for her extensive editing of the elements of the bibliography, and My-Huong Nguyen and Penny Sappington for converting the bibliographical information into machine-readable form.

TABLE 1

Number of References in the Bibliography by Decade

<u>DECADE</u>	<u>NUMBER OF REFERENCES</u>
1900-1909	2
1910-1919	6
1920-1929	20
1930-1939	49
1940-1949	13
1950-1959	66
1960-1969	168
1970-1979	150
1980-1986	38

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(0.35-1.76 MeV: C, Na, Mg, Al, P, S, K, Ca, Fe, Co, Ni, Cu, Zn, As,
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(11.76-118.1 keV: Li, C, N, O, Al, Fe, H₂O)

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 C₂H₅Cl, Paraffin (CH₂), (C₂H₅)₂O, CHCl₂, CCl₄, Zr(CH₃)₂, C₂H₅Br, CH₃I)
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 (8.048-22.16 keV: Bi)
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K, Ti, Cr, Mn, Ni, Cu, Br, Rb, Sr, Zr, Ag, Cd, I, Ba; Measured: LiOH,
MgO, NaF, NaCl, NaNO₂, KCl, NiO, CuO, TiO₂, NaHCO₃, NaNO₃, MnO₂, CuCl,
CrO₃, Al₂O₃, Na₂CO₃, KBr, RbCl, ZrO₂, SrF₂, KH₂PO₄, Na₂SO₄, AgCl, BaO,
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Bermudex-Polonio, J.,	84Vi01	Brinsek, A.,	69Be02
Berry, A. A.,	79Be01	Brookes, G. R.,	67Br01 67Br02 72Ra01
Beynon, J. D. E.,	65Be01 66Be02	Brown, F. C.,	69Fu01 70Br01 70Ga01 72Br01 72Ha01 78Bi01
Bezdenzhnykh, G. V.,	67Be01	Brown, P.,	74Sh01
Bezic, N.,	62Mi01 63Be01 69Be01 69Be02	Brown, W. R.,	74Sh01
Bianconi, A.,	78Bi01	Bruhn, R.,	78Br01 78Br02

Brytov, I. A.,	64Lu01 64Lu03 66Lu01 67Er02	Chao, C. Y.,	32Ch01
Bucklow, I. A.,	68Hu02	Chapman, J. C.,	10Ch01 11Ch01
Buckman, W. G.,	62Bu01	Chartier, J. L.,	77Ch01
Burbidge, P. W.,	22Bu01	Chaudhuri, N.,	71Go01 73Go03
Burek, A. J.,	79Ba01	Chin, A. K.,	73Ph01
Cairns, R. B.,	65Be01 65Sa01	Chipman, D. R.,	55Ch01 61Ba02 63Ch01
Callisen, F. I.,	37Ca01	Chisholm, A.,	72Ch01
Calvert, L. D.,	75Ca01	Chong, C. S.,	86Br01
Canada, T. R.,	77Ca01	Christmas, P.,	74Ch01
Cannata, A.,	82Ba01	Cipriani, A. J.,	47Ma01
Cardona, M.,	70Ca01	Clark, K. C.,	52C101
Carlson, R. W.,	73Ca01 73Le01	Claude, A.,	83Sh02
Carlton, R. F.,	73Ca02	Clough, A. S.,	72Ra01
Carlton, W. R.,	67Ca01	Cochran, R. G.,	73Ah01
Carroll, E. E., Jr.,	60Ca01	Codling, K.,	66Co01 77Co01 78Co02
Carr, L. H.,	34Ca01	Cole, B. E.,	78Co01
Carter, R. W.,	67Ca01	Cole, M.,	64Co01
Carter, V. L.,	67Hu01 67Hu02 68Hu01	Colgate, S. A.,	52Co01
Caruso, A. J.,	74Ca01	Colvert, W. W.,	30Co01
Cate, J. L.,	65Pr01	Combet Farnoux, F.,	68Ja01 75Cu01 78Cu01
Cesareo, R.,	79Ce01	Combley, F. H.,	68Co0
Chambers, K. C.,	79Ba01	Comes, F. J.,	64Co02 68Co02
Champier, G.,	570101	Conner, A. L.,	67Mc01 70Co01
Chand, K. P.,	76Ch01		

Constanten, C. P.,	70Mc02	Delbianco, W.,	85Sh01
Cooke, B. A.,	62Co01 64Co03	Del Grande, N. K.,	67De01 69De01 69De02 71De01 73De01 81De01
Cook, G. R.,	64Co04		
Cooper, D. H.,	55Co01		
Cooper, M. J.,	65Co01	Delsasso, L. A.,	37De01 37De02
Cork, J. M.,	44Co01 45Co01	DeMarco, J. J.,	61Ba02 65De01 69Di01 71De02
Costa Lima, M. T.,	76Se01		
Coster, D.,	31Co01	Denne, D. R.,	70De01 70De02
Cowan, C. L.,	48Co01		
Crane, H. R.,	39Ha01	de Reilhac, L.,	70De03 71De03
Creagh, D. C.,	76Cr01 77Cr01	Dershem, E.,	230I01 31De01
Cremonese, M.,	68Ja01	Deslattes, R. D.,	59De01 68De01 69De03
Crowther, J. A.,	32Cr01		
Cukier, M.,	74Cu01 75Cu01 78Cu01	de Thy, B.,	80He01
Cukor, P.,	70Lu01	Deutch, B. I.,	61De01
Curtis, J. P.,	54Cu01 55Ab01	Dewire, J. W.,	51De01
		Dexter, R. N.,	78Co01
Cuykendall, T. R.,	36Cu01	Dhez. P.,	67Ja01 68Ja01 70Dh01 74Cu01 75Cu01 78Cu01
Czock, K. H.,	75Ah01		
Dalton, J. L.,	69Da01		
Damany-Astoin, N.,	70De03 71De03 75Da01	Diana, M.,	69Di01 72Di01
Davidson, W. F.,	83Sh02 85Sh01	Ditchburn, R. W.,	60Di01
Davisson, C. M.,	51Da01	Dixon, W. R.,	68Di01
Day, R. H.,	81Da01	Dodds, D. E.,	60Eh01

Donahue, D. J.,	65Ba01	Evans, R. D.,	51Da01
Douglas, A. C.,	67Pe01	Ewart, G. M.,	83Sh01
Dowe, R. M., Jr.,	65Do01	Fagieh, M.,	79Ma01 81Ma01
Drexler, G.,	68Pa01	Fessel, R.,	66Wa01
Duane, W.,	22Du01	Fidecaro, M.,	62Fi01
Dudley, J. M.,	54Ke01	Finocchiaro, G.,	62Fi01
Duncumb, P.,	65Du01	Firk, F. W. K.,	70Wu01
Dyer, G. R.,	62Dy01 67Ca01	Fischer, D. W.,	70Fi01 71Fi01
Ebel, H.,	700r01	Fischer, K. F.,	82Sc01
Ebisu, E. S.,	73He01	Fisher, E. I.,	64Ru02
Ederer, D. L.,	64Al01 64Ed01 64Ed02 65Lo01 71Ed01 75Ed01 78Me01	Fomichev, V. A.,	67Fo01 67Zh01 67Zi01 68Fo01
Edwards, J. E.,	33He01 68Bo01	Fowler, W. A.,	37De01 37De02
Efimov, O.,	68Ef01	Freeland, J. H.,	72Ra01
Ehrenfried, C. E.,	60Eh01	French, R. L.,	55Fr01
Ekstig, B.,	68Ek01	Fujii, H.,	76Fu01
Elgin, R. L.,	67He01	Fujita, H.,	69Fu01 70Br01
Elzer, A.,	64Co02	Fuller, C. H.,	64Ru02
Eppler, H. B.,	71Ah01 75Ah01	Funk, L. W.,	74Sh01
Ergun, S.,	58Er01	Gableske, R.,	66Ga01
Ershov, O. A.,	64Lu02 66Er01 67Er01 67Er02	Gähwiller C.,	69Fu01 70Br01 70Ga01
Esposito, A.,	82Ba01	Galbraith, W.,	72Ra01
		Ganeev, A. S.,	60Ga01

Ganguly, N. K.,	53Gh01 57Gh01	Govelitz, G. F.,	77Ra01
Gardner, J. L.,	77Sa01 77Sa02	Gowda, R.	74Go01 76Go01 79Pu01 81Um01 82Um01 85Go01
Garton, W. R. S.,	60Pe01	Greening, J. R.,	74Mi01
Gates, D. C.,	62Ga01	Gregg, E. C.,	75Ra01
Gauthé, B.,	78Cu01	Gribovskii, S. A.,	66Lu01 66Lu02 67Zi01 73Gr01
Gazzara, C. P.,	67Mi01	Griffiths, G. M.,	51Ar01
Gentner, W.,	34Ge01 35Ge01 35Ge02	Grimvall, G.,	69Gr01
Gerward, L.,	77Ge01 81Ge01 82Ge01 82Ge02 83Ge01	Grodzins, L.,	65Al01
Ghezzi, C.,	71Gh01	Groetzinger, G.,	45Gr01
Ghose, A. M.,	53Gh01 57Gh01 86Br01	Grosskurth, K.,	34Gr01
Ghumman, B. S.,	68Gh01	Gudat, W.,	70Ca01
Giacomelli, G.,	62Fi01	Gundrum, H.,	71Ah01 75Ah01
Giardina, M. D.,	73Gi01	Gurevich, G. M.,	80Gu01
Gimm, H.,	71Ah01 75Ah01	Haddad, G. N.,	77Sa01 77Sa02
Givens, M. P.,	55Wo01 59Ax01	Haensel, R.,	68Ha01 69Ha01 69Ha02 69Ha03 69So01 70Ha02
Glaser, H.,	51Gl01	Hahn, T. M.,	34Ha01
Goldak, J.,	69Da01	Halpern, J.,	39Ha01
Gomi, K.,	72Mi01 73Mi02	Hamley, J. R.,	77Co01 78Co02
Gopal, S.,	73Go01 73Go02	Hammer, J. W.,	76Ha02
Goswami, B.,	71Go01 73Go03		

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Hansen, H.,	39Ha02	Hribar, M.,	73Hr01
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Hanser, F. A.,	74Ha01	Hübel, H.,	59Hu01
Hartl, W.,	76Ha02	Huber, P.,	54Sc01
Haslam, R. N. H.,	58Be01	Hudson, R. D.,	67Hu01 67Hu02 68Hu01
Hayes, W.,	72Ha01	Huffman, R. E.,	63Hu01 73Ka01
Heath, R. L.,	53Be01	Hughes, G. D.,	64Co01 66Hu01 68Hu02
Heil, L. M.,	33He01	Hull, A. W.,	16Hu01
Heinrich, K. F. J.,	66He01 68Ho01	Hunter, W. R.,	64Hu01 66Co01
Hemidy, A.,	80He01	Hupfeld, H. H.,	31Me01
Henke, B. L.,	67He01 73He01	Hutcheon, R. M.,	74Sh01
Henrich, V. E.,	69Ra01	Ikeda, H.,	76Fu01
Henry, L. C.,	71He01	Inkinen, O.,	69Ja01 70In01
Hewlett, C. W.,	21He01	Ishii, T.,	76Fu01
Hildebrandt, G.,	73Hi01	Israilev, I. M.,	67Be01
Hill, R. D.,	37Hi01	Itano, A.,	74Ho01 76Fu01
Hoffman, E. J.,	75Ph01	Izrailev, I. M.,	60Ga01
Hogg, W. R.,	72Ra01	Jackson, R. S.,	65Ma01
Holweck, F.,	20Ho01 28Ho01	Jacobsen, J. C.,	36Ja01
Homma, S.,	74Ho01 76Fu01	Jaegle, P.,	66Ja01 67Ja01 68Ja01 70Dh01 74Cu01 75Cu01 78Cu01
Hon, P. K.,	68Ho01		
Hopkins, J. I.,	59Ho01		
Horsley, R. J.,	58Be01		
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Jamnik, D.,	62Mi01 63Be01 69Be01 69Be02	Katsuura, K.,	74Ho01
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Jarvinen, M.,	69Ja01	Keller, J.,	76Lu01
Jaworowski, R. J.,	70Lu01	Kennett, T. J.,	71He01
Jennings, L. D.,	63Ch01	Kenney, R. W.,	54Ke01 56An01 56An02 57Br01 62Ga01
Jnanananda, S.,	57Ra01 58Sa01 61La01 63Ra01	Kernel, G.,	63Be01 69Be01 69Be02
Johnson, J. M.,	76St01	Ketelaar, H.,	34Ke01
Johnston, R. W.,	54Jo01	Khan, J. M.,	64Kh01
Jones, M. T.,	36Jo01	Killean, R. C. G.,	75Ca01
Jones, W. B.,	59Jo01 60Jo01	King, A. F.,	72Ra01
Jönsson, E.,	28Jo01	Kiszenick, W.,	74Ki01
Joyet, G.	74Jo01	Knasel, T. M.,	68Kn01
Joyet, M. L.,	74Jo01	Knerr, R. P.,	67Kn01
Judge, D. L.,	73Ca01 73Le01 77Le01 77Ph01 79Wu01 85Wu01	Koch, H. W.,	60Wy01
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Kanemori, Y.,	60Ka01 67Ka01	Kosaki, M.,	85Sh01
Karev, V. N.,	64Ka01	Kosman, M.,	34Al02
Katayama, D. H.,	73Ka01	Kreger, W. E.,	54Ho01
		Kroger, H.,	63Kr01
		Krönig, M.,	75An01
		Kubo, H.,	70Ku01

Kunju, S. N.,	86Va01	Ledingham, R. B.,	67He01
Kunz, C.,	68Ha01 69Ha01 69Ha02 69Ha03 69So01	Lee, L. C.,	73Ca01 73Le01 77Le01 77Ph01 79Wu01
Kurtz, H.,	28Ku01	Lee, P.,	52Le01 52We01
Küstner, H.,	31Ku01 32Ku01		52We02 53Le01 55Le01 81Da01
Kusumegi, A.,	72Mi01 73Mi02	Lefeld-Sosnowska, M.,	64Le01
Kyser, D. F.,	72Ky01	Lent, R. E.,	67He01
Lakshminarayana, V.,	61La01 63Ra01 76Ch01 76Re01 77Mu01 77Ra02 86Pr01	Levine, A.,	72Mc01
		Lewis, G. M.,	72Ra01
		Lihl, F.,	700r01
		Ling, D.,	65Li01
Lang, J.,	73Wa01 73Wa02 75La01	Lingam, S. C.,	83Li01 84Ba01 84Li01 85Re01
Lang, K. C.,	32Ma01		
Larrabee, J. C.,	63Hu01	Lingappa, N.,	86Si01
Larrad, A. J.,	710t01	Little, R.,	66Wa01
Laubert, S.,	41La01	Loewenstein, M., J.	72St01
Lauritsen, C. C.,	34Re01 37De01 37De02	Lokan, K. H.,	74Sh01
		Lombardi, G. G.,	78Lo01
LaVilla, R. E.,	69La01	Loomis, T. C.,	75Lo01
Lawrence, J. L.,	76La01 77La01 79Be01 79La01	Looney, L. D.,	70Mc01 70Mc02
		Lowry, J. F.,	65Lo01
Lawson, J. L.,	49La01	Lublin, P.,	70Lu01
Lazareva, L. E.,	80Gu01	Lucas, G. J.,	640g01

Lukirskii, A. P.,	63Lu01 64Lu01 64Lu02 64Lu03 66Er01 66Lu01 66Lu02 67Er02 67Fo01	Matsunaga, F. M.,	65Ma01 67Ma01
Lurio, A.,	75Lu01 76Lu01 77Lu01	Mavroyannakis, E.,	70Ma01 73Ma01
Machali, F. M.,	79Ma01 81Ma01	Mayneord, M. V.,	35Ma01 47Ma01
Madden, R. P.,	66Co01	Mazumder, K. C.,	22Du01 30Ma01
Madhusudanan, K.,	86Va01	Mazur, V. M.,	80Gu01
Mahmoud, K. A.,	57Ma01	Mazzone, G.,	69Di01 72Di01
Maitra, A. T.,	36Ba01	McClintock, J. E.,	72Mc01
Malamud, E.,	59Ma01	McCrary, J. H.,	67Mc01 70Co01 70Mc01 70Mc02
Mallett, J. H.,	69De01	McDaniel, B. D.,	47Mc01
Manalis, M.,	75Ed01	McDonald, C. A., Jr.,	54Ke01 56An01 56An02
Mancini, C.,	79Ce01	McGuire, E. J.,	63Pe01
Mannhart, W.,	76Ma01	McMillan, E.,	34Mc01
Mantler, M.,	74Ma01	Mehlman, G.,	78Me01
Marmo, F. F.,	58Ma01	Mehta, M. K.,	84Ra02
Marr, G. V.,	76We01 78Ma01	Meitner, L.,	31Me01
Martin, L. H.,	25St01 32Ma01	Melford, D. A.,	65Du01
Martin, L. J.,	85Mi01	Mercure, R.,	55Ab01
Maruyama, K.,	74Ho01 76Fu01	Merisalo, M.,	69Ja01
Mathieson, A. McL.	75Ca01 76La01	Merkulov, S. Y.,	80Gu01
Matin, P.,	60Ma01	Merlini, A.,	65Me01 67Ba01 71Gh01 73Gi01

Messner, R. H.,	33Me01	Narasimhan, K. L.,	86Pr01
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Mika, J. F.,	85Mi01	Nicholson, J. P.,	72Ch01
Miklavzic, U.,	62Mi01 69Be01	Nikolaev, F. A.,	66Ni01
Millar, R. H.,	73Mi01 74Mi01	Nishikawa, K.,	74Ho01
Mishina, M.,	72Mi01 73Mi02	Nordfors, B.,	61No01 61No02
Missoni, G.,	66Ja01 67Ja01	Noreland, E.,	61No02 62No01
Miyachi, T.,	72Mi01 73Mi02 74Ho01	Notz, D.,	69No01
Moffatt, J.,	58Mo01 59Mo01	Nowak, A.,	85Sh01
Mohr, E. I.,	52We01	Ogawa, M.,	73Ca01 73Le01
Moljk, A.,	73Hr01	Ogier, W. T.,	640g01
Moreh, R.,	69Mo01 74Ba01 75Mo01 75Mo02 85Bi01	Ohshima, E.,	76Fu01
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Muller, I.,	38Mu01	Okuna, H.,	72Mi01 73Mi02 74Ho01 76Fu01
Murty, R. C.,	64Mu01	Oliver, A. J.,	67De01 69De01 69De02 71De01 73De01
Murty, V. R. K.,	76Ch01 76Re01 77Mu01 77Ra02	Olmer, P.,	81De01 570101
Nagel, D. J.,	81Da01	Olson, A. R.,	230101
Nakamori, H.,	70Ku01	Onori, G.,	68Ja01
		Ortner, B.,	700r01
		Orton, L. H. H.,	32Cr01

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Pace, S.,	65Me01 71Gh01	Peterson, H.,	85Re01
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Panzer, W.,	68Pa01	Phelps, M. E.,	75Ph01
Pareek, P. N.,	85Sa01	Phillips, E.,	77Le01 77Ph01
Park, R. J.,	640g01	Phillips, L. F.,	71Be01
Parkinson, W. C.,	49Pa01	Phillips, W. C.,	73Ph01
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Parthasaradhi, K.,	69Pa01 73Ra02 73Ra03 73Ra04 73Ra05 74Pa01 76Ha01 77Mu01 77Ra02 86Pr01	Pidd, R. W.,	44Co01
Patel, J. R.,	68Ba01	Piper, S. H.,	10Ch01
Paul, R. S.,	54Pa01	Pinc, R.,	63Be01
Peaple, L. H. J.,	78Pe01	Plachenov, B. T.,	58Bo01
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Pell, E. M.,	51To01	Post, R. F.,	56An02
Pelliccioni, M.,	82Ba01	Potter, D. L.,	64Kh01
Perkin, J. L.,	67Pe01	Pounds, K. A.,	62Co01
Persson, E.,	68Ef01 69Gr01	Powers, D.,	85Go01
Perumallu, A.,	84Ra01 35Pe01	Prakhya, R. S.,	86Pr01
		Prasad, G. A.,	73Ra05
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		Pregenzer, A. L.,	79Ba01
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		Prevo, C. T.,	65Pr01

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Ramani,	73Ra01	Rappaport, S.,	72Mc01
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Rao, A. S. N.,	84Ra01 85Pe01	Reddy, D. K. S.,	76Ch01 76Re01
Rao, B. D. N.,	57Ra01	Reddy, D. V. K.,	83Li01 84Ba01 84Li01 85Re01
Rao, B. M.,	73Ra02 73Ra03		
Rao, B. V. T.,	73Ra02 73Ra03 73Ra04	Reddy, S. B.,	86Pr01
Rao, D. V.,	77Ra01 81Ra01 82Ra01	Rense, W. A.,	55Ab01
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Rao, I. S. S.,	84Ra02	Rice, M.,	16Hu01

Richardson, J. E.,	53Be01	Samson, J. A. R.,	64Sa01
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	23Ri01		64Sa03
	26Ri01		65Sa01
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	75Ah01		77Sa01
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	45Ro01		73Go02
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Robertson, A. W. R.,	72Ra01		76Go01
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Robinson, L. B.,	58Be01		81Um01
			82Um01
Rogers, J. S.,	32Ro01	Sankaranarayanan, P. E.,	73Ra01
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			69Ha01
Rothe, D. E.,	71Ro01	Sastry, K. S. R.,	58Sa01
			77Ra01
Roux, A. M.,	76Ro01		
Roy, J.,	85Sh01	Sato, I.,	72Mi01
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Russell, P. C.	62Co01	Savinov, E. P.	64Lu02
Rustgi, O. P.,	64Ru01	Schäfer, G. F.,	82Sc01
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Rutherglen, J. G.,	67Br01	Schikarski, W.,	57Sc01
	67Br02	Schmid, P.,	54Sc01
Sadler, C. A.,	07Ba01	Schnopper, H. W.,	62Sc01
	09Ba01	Schocken, K.,	29Sc01
Sahota, H. S.,	72Sa01	Schoknecht, G.,	63Sc01
Saloman, E. B.,	78Me01		
	81Da01		
Salzmann, D.,	69Mo01		

Schopper, H.,	57Sc02	Smith, I. L.,	67Br01 67Br02
Schreiber, P.,	69Ha03	Smith, L.,	45Gr01
Schulz, K.,	36Sc01	Smith, P. L.,	78Lo01
Schumacher, M.,	59Sc01 69Sc01	Snajder, J.,	69Be02
Seal, R. T.,	61Sw01	Solodukhov, G. V.,	80Gu01
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Shrader, E. F.,	52Ro01	Stephenson, J. D.,	73Hi01
Siddapa, K.,	86Si01	Stephenson, R. J.,	33St01
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Siegbahn, M.,	20Si01	Stewart, D. T.,	73Wa01 73Wa02
Singer, S.,	67Si01	Stinner, R. J.,	67De01 69De02
Singh, M.,	73Al01		
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Stockmeyer, W.,	32St01	Tombouliau, D. H.,	51To01
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Z = 2			He		16 REFERENCES		
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Z = 4			Be		40 REFERENCES		
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Z = 8		O		51 REFERENCES			
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Z = 12		Mg		32 REFERENCES			
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67Er01	67Mc01	68Ho01	68Hu02	68Ko01	69Da01	69Di01	69Mo01
69So01	70Co01	70Lu01	70Ma01	72Ky01	74Si01	75Mo01	75Mo02
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22Wi01	23Ri01	25St01	26Al01	28Jo01	29Ba01	30Ta01	31Co01
31Me01	32Ch01	32Ma01	32Ro01	33He01	34Gr01	34Ha01	34Mc01
35Ge02	35Ma01	35Re01	36Cu01	37Hi01	38An01	41La01	44Co01
45Co01	47Ma01	48Ad01	48Al01	48Co01	49La01	49Wa01	51Ar01
51Da01	51De01	52Co01	52Ja01	52Ro01	52Sh01	52Wy01	53Be02
53Gh01	54Ho01	54Pa01	54Sc01	55Co01	55Fr01	56Ba01	57Ra01
57Sc01	57Sc02	57To01	58Mo01	58Sa01	59Ba01	59De01	59Ho01
59Hu01	59Ma01	60Eh01	60Ka01	61Ba02	61La01	62Dy01	62Fi01
62Wi01	63Ra01	63So01	64Co03	64Ka01	64Kh01	64Mu01	65Ba01
65Co01	65Th01	65We01	66Be01	66Hu01	67Ba01	67De01	67Kn01
67Mc01	68Bo01	68Ho01	68Hu02	68Kn01	68Pa01	69Da01	69De02
69Mo01	69So01	69We01	70Co01	70Ku01	70Or01	71Ah01	71Gh01
71He01	72Ky01	72Sa01	73Ah01	73Ca02	73Go01	73Go02	73Mi02
73Ra02	74Ch01	74Go01	74Ho01	74Ma01	74Pa01	74Si01	75Mo01
76Ch01	76Go01	76Ha01	76Ro01	77Mu01	77Ph01	77Sh01	78Br01
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84Ra01	84Ra02	85Va01					

	Z = 30		Zn		45 REFERENCES		
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31Me01	32Ch01	32Ma01	32Ro01	35Ge02	36Ja01	39Wr01	52Sh01
53Be02	57Gh01	57Ra01	56Ba01	57Br01	57Ra01	57To01	58Bo01
59Ho01	60Eh01	65Me01	65We01	67Ca01	67Kn01	67Mc01	68Ko01
69De02	69Mo01	70Co01	71Gh01	72Ky01	73Go03	74Ma01	74Si01
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	Z = 32		Ge		19 REFERENCES		
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	Z = 40		Zr		28 REFERENCES		
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	Z = 41		Nb		16 REFERENCES		
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62Wi01	64Ka01	67De01	67Kn01	67Mc01	67Zh01	68Ho01	68Ko01
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Z = 46			Pd	10 REFERENCES			
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34Ha01	35Ge02	36Bi01	36Ja01	36Jo01	36Sc01	37Hi01	38An01
41La01	47Ma01	52Sh01	52Wy01	53Be02	57Gh01	58Mo01	59De01
59Hu01	60Eh01	61No01	62Wi01	64Co03	64Lu02	67Mc01	67Zh01
68Gh01	68Ha01	68Ho01	68Hu02	68Ko01	69De02	69Mo01	70Co01
72Sa01	73Mi02	73Ra03	74Go01	74Ma01	75Lu01	75Mo01	75Mo02
76Go01	76Lu01	77Lu01	77Mu01	77Ra02	78Pr01	79Ce01	79Pu01
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Z = 48			Cd	31 REFERENCES			
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61No02	62Wi01	63Ra01	67Kn01	70Ma01	71He01	73Ra04	73Ra05
74Ra01	75Mo01	76Ch01	78Co02	80Pr01	81Um01	84Ra01	
Z = 49			In	9 REFERENCES			
34Gr01	60Ma01	61No02	62Wi01	64Hu01	67Mc01	80Pr01	82Ra01
84Ra01							
Z = 50			Sn	78 REFERENCES			
07Ba01	09Ba01	14Br01	17Ko01	22Wi01	25St01	26Al01	26Ri01
27Ri01	30Ta01	31Ku01	31Me01	32Ch01	32Ma01	32Ro01	34Gr01
34Ke01	34Mc01	35Ma01	36Bi01	36Jo01	41La01	48Co01	49La01
49Wa01	51Da01	51De01	52Co01	52Ja01	52Ro01	52Sh01	53Be02
53Hu01	54Pa01	54Sc01	55Co01	57Gh01	57Ma01	57Ra01	57Sc01
59De01	59Ma01	60Eh01	61No02	62Wi01	65Ba01	66Be01	66Co01
66Lu02	66Qu01	67De01	67Kn01	67Mc01	68Gh01	68Ha01	68Ho01
69De02	69Pa01	70Co01	71Ah01	72Sa01	73Go01	73Go02	73Mi02
74Ch01	74Go01	74Ma01	74Pa01	75Mo01	76Go01	76Ha01	77Mu01
78Ra01	79Ce01	79Pu01	80Gu01	81Ma01	84Ra01		
Z = 51			Sb	10 REFERENCES			
17Ko01	30Ta01	32Ro01	36Bi01	39Wr01	52Sh01	53Be02	61No02
70Ma01	84Ra01						

	Z = 52		Te		12 REFERENCES		
17Ko01	36Bi01	36Sc01	39Wr01	52Sh01	55Wo01	58Bo01	61No02
66Lu02	70Mc02	73So01	84Ra01				
	Z = 53		I		10 REFERENCES		
22Wi01	35Ma01	36Ja01	39Ha02	39Wr01	53Gh01	63Sc01	73Go03
81Um01	84Ra01						
	Z = 54		Xe		22 REFERENCES		
31De01	34Wh01	63Ch01	64Ed01	64Lu01	64Ru02	65Ma01	65Wa01
66Ga01	66Lu01	66Sa01	67He01	67Ni01	67Zi01	68De01	69Ha03
69Wu01	70Mc02	71Be01	71Ed01	75Ed01	75La01		
	Z = 55		Cs		2 REFERENCES		
71ot01	73Go03						
	Z = 56		Ba		10 REFERENCES		
22Wi01	26A101	38Mu01	68Ko01	71ot01	73Go03	74Ra02	81Um01
82Sc01	84Ra01						
	Z = 57		La		8 REFERENCES		
67Mc01	67Zi01	69De02	70Co01	71ot01	73Go03	82Um01	84Ba01
	Z = 58		Ce		10 REFERENCES		
39Wr01	67Zi01	69Mo01	70Ha02	70Or01	71ot01	73Go03	75Mo01
82Um01	84Ba01						
	Z = 59		Pr		7 REFERENCES		
61Bo02	67Zi01	69Da01	70Ha02	70Or01	82Um01	84Ba01	
	Z = 60		Nd		8 REFERENCES		
67Kn01	67Zi01	70Ha02	70Or01	73Go03	80Pr01	82Um01	84Ba01
	Z = 62		Sm		9 REFERENCES		
67Zi01	69De01	69De02	70Ha02	70Or01	73Go03	77Mu01	82Um01
84Ba01							
	Z = 63		Eu		2 REFERENCES		
67Zi01	84Ba01						
	Z = 64		Gd		16 REFERENCES		
67Kn01	67Mc01	67Zi01	68Ho01	69Da01	69De02	70Co01	70Or01
73Go03	77Ra01	80Gu01	81Ra01	82Ra01	82Um01	84Ba01	84Li01
	Z = 65		Tb		5 REFERENCES		
69De01	69De02	73Gr01	84Ba01	86Pr01			
	Z = 66		Dy		7 REFERENCES		
67Zi01	73Go03	81Ra01	82Ra01	82Um01	84Ba01	84Li01	
	Z = 67		Ho		9 REFERENCES		
67Kn01	67Zi01	69De01	69De02	70Or01	80Gu01	82Um01	84Ba01
86Pr01							

	Z = 68		Er		7 REFERENCES		
67Zi01	69Da01	80Gu01	82Um01	84Ba01	84Li01	86Pr01	
	Z = 69		Tm		4 REFERENCES		
67Zi01	69De01	69De02	84Ba01				
	Z = 70		Yb		9 REFERENCES		
67Kn01	67Zi01	68Co01	69De01	69De02	70Or01	73Go03	80Gu01
84Ba01							
	Z = 71		Lu		2 REFERENCES		
67Zi01	68Co01						
	Z = 72		Hf		8 REFERENCES		
64Ka01	67Mc01	68Ko01	69De01	69De02	70Co01	76Lu01	80Gu01
	Z = 73		Ta		42 REFERENCES		
34Gr01	34Ha01	35Ma01	36Jo01	41La01	51Da01	52Sh01	53Be02
53Hu01	54Ho01	59Ma01	62Wi01	64Sa02	66He01	66Hu01	67De01
68Co01	68Ho01	68Hu02	68Ja01	68Ko01	69De02	69Ha02	69Mo01
73Mi02	74Go01	74Pa01	75Mo01	76Go01	76Lu01	77Ka01	77Lu01
77Mu01	77Ra02	77Sh02	78Ra01	79Pu01	80Gu01	82Um01	83Li01
83Sh01	85Re01						
	Z = 74		W		42 REFERENCES		
17Ko01	26Al01	26Ri01	31Me01	32Ro01	34Gr01	34Ha01	41La01
52Ja01	52Sh01	52Wy01	53Be02	54Ho01	58Sa01	59De01	61La01
62Wi01	66Qu01	67De01	67Kn01	67Mc01	68Gh01	68Ko01	68Pa02
69De02	69Ha02	70Co01	70Lu01	71He01	73Mi02	73Ra02	75Mo01
75Mo02	76Lu01	77Lu01	77Mu01	78Pr01	80Gu01	82Ra01	83Li01
84Ra01	85Re01						
	Z = 75		Re		2 REFERENCES		
69Ha02	76St01						
	Z = 77		Ir		3 REFERENCES		
41La01	69De01	75Cu01					
	Z = 78		Pt		26 REFERENCES		
07Ba01	09Ba01	14Br01	26Al01	28Jo01	29Ba01	32Ro01	33Wo01
34Gr01	35Ma01	41La01	47Ma01	52Co01	52Sh01	53Be02	59De01
60Eh01	62Wi01	68Ho01	68Ja01	69Ha02	69Pa01	74Ch01	78Pr01
82Ra01	86Pr01						
	Z = 79		Au		57 REFERENCES		
09Ba01	14Br01	17Ko01	22Wi01	26Al01	26Ri01	29Ba01	31De01
32Ro01	33Wo01	34Gr01	36Sc01	38An01	41La01	52Co01	52Sh01
53Be02	59Be01	59De01	60Ma01	62Wi01	64Lu02	65Al01	66Be01
66Hu01	66Ja01	67Er01	67Er02	67Mc01	68Gh01	68Ho01	68Hu02
69De02	69Ha02	70Co01	70Lu01	73Ra03	74Go01	74Ha01	74Ma01
74Pa01	75Lu01	75Mo01	76Go01	76Lu01	76Re01	77Ch01	77Lu01
77St01	77Sh01	78Ra01	79Ce01	79Ma01	79Pu01	80Gu01	83Li01
85Re01							

	Z = 80		Hg		13 REFERENCES			
17Ko01	31Me01	31Ub01	32Ro01	36Ja01	47Ma01	52Sh01	57Gh01	
57Ra01	64Mu01	66Qu01	73Go03	84Ra01				

	Z = 81		Tl		4 REFERENCES			
38Mu01	52Sh01	61De01	65Do01					

	Z = 82		Pb		129 REFERENCES			
16Hu01	17Ko01	21Ri01	22Wi01	26A101	26Ri01	30Ta01	31Me01	
32Ch01	32Ku01	32Ro01	34A102	34Ge01	34Gr01	34Ha01	34Ke01	
34Mc01	35Ge01	35Ma01	35Re01	36Ja01	36Jo01	36Sc01	37De01	
37De02	41La01	44Co01	45Co01	45Gr01	45Ro01	47Ma01	47Mc01	
48Ad01	48A101	48Co01	49La01	49Wa01	51Ar01	51Da01	51De01	
52Co01	52Ja01	52Ro01	52Sh01	52Wy01	53Be01	53Be02	53Gh01	
54Ke01	54Pa01	54Sc01	55Co01	56An01	56Ba01	57Br01	57Gh01	
57Ma01	57Ra01	57Sc01	57Sc02	58Bo01	58Mo01	59Hu01	59Ma01	
59Sc01	60Be01	60Ka01	61La01	62Ba02	62Fi01	62No01	62Wi01	
63Ra01	65Ba01	65Th01	66Hu01	66Lu02	66Qu01	67De01	67Ka01	
67Kn01	67Mc01	68Di01	68Gh01	68Kn01	69De02	69Mo01	69Pa01	
69Sc01	69We01	70Co01	70Ma01	70Or01	71Ah01	71He01	72Ch01	
72Sa01	73Ah01	73A101	73Go01	73Go02	73Go03	73He01	73Mi02	
73Ra01	73Ra02	73Ra03	73Ra04	74Ba01	74Ch01	74Pa01	74Sh01	
75Lu01	75Mo01	75Mo02	76Go01	76Re01	77Ka01	77Mu01	77Sh01	
78Ra01	79Ce01	79Pu01	81Ma01	82Um01	83Li01	84Ra01	84Ra02	
85Re01								

	Z = 83		Bi		22 REFERENCES			
17Ko01	26A101	30Ta01	32Ro01	34Ca01	36Sc01	47Ma01	52Co01	
52Sh01	53Be02	66Hu01	67Ja01	68Ha01	69Mo01	70Dh01	74Su01	
75Mo01	77Sh02	80Gu01	82Um01	83Sh01	84Ra01			

	Z = 90		Th		15 REFERENCES			
26A101	53Be01	59Ro01	62Wi01	67Be01	67Mc01	69De02	70Co01	
76Re01	77Ch01	77Mu01	77Ra02	78Cu01	78Ra01	84Ra01		

	Z = 92		U		40 REFERENCES			
26A101	32Ku01	32Ro01	33St01	34Ke01	36Ja01	47Ma01	49La01	
51De01	52Co01	52Ja01	52Ro01	52Wy01	53Be01	54Pa01	58Mo01	
59Ma01	59Ro01	65Th01	67Be01	67Mc01	67Pe01	69De02	69Mo01	
70Co01	71He01	73De01	73Ra03	74Cu01	74Ra01	75Mo01	75Mo02	
76Ha01	76Re01	77Ch01	77Mu01	78Cu01	81De01	84Ra01	85Sh01	

	Z = 94		Pu		5 REFERENCES			
59Ro01	67Mc01	70Co01	77Ca01	77Ch01				

COMPOUND AND MATERIAL INDEX

70Br01	AgCl	81Um01	84Um01	3 REFERENCES
58Er01	Al ₂ O ₃	81Um01		2 REFERENCES
39Wr01	As ₂ O ₇			1 REFERENCE
84Ra01	Ba(NO ₃) ₂			1 REFERENCE
81Um01	BaO	84Um01		2 REFERENCES
64Lu03	BeO	65Pr01	82Ba01	3 REFERENCES
84Ra01	Bi(NO ₃) ₃ *5H ₂ O			1 REFERENCE
82Um01	Bi ₂ O ₃	84Um01		2 REFERENCES
69We01	B ₂ O ₃			1 REFERENCE
81Um01	CaCl			1 REFERENCE
86Br01	CaCO ₃			1 REFERENCE
84Ra01	CaF ₂			1 REFERENCE
39Wr01	CaH ₂			1 REFERENCE
82Ba01	CaSO ₄ :Dy(Teledyne:Teflon disks)			1 REFERENCE
82Ba01	CaSO ₄ :Dy(TLD 900)			1 REFERENCE
84Ra01	CaTe			1 REFERENCE
30Wo01	CCl ₄	32Cr01	67He01	3 REFERENCES

84Ra01	CdCl_2	1 REFERENCE
81Um01	CdI_2	1 REFERENCE
58Bo01	CdSb	1 REFERENCE
39Wr01	CeO_2 82Um01 84Um01	3 REFERENCES
70Ha02	Ce_2O_3	1 REFERENCE
79Wu01	CF_2Cl_2	1 REFERENCE
77Le01	CF_3Cl	1 REFERENCE
74Mi01	CF_4 77Le01	2 REFERENCES
67He01	C_2F_2	1 REFERENCE
77Le01	C_2F_6	1 REFERENCE
69De02	CH	1 REFERENCE
32Cr01	CHCl_2	1 REFERENCE
33St01	CHF_3	1 REFERENCE
39Wr01	CHI_3	1 REFERENCE
32Cr01	CH_2 62Fi01	2 REFERENCES
69We01	$(\text{CH}_2)_n$	1 REFERENCE
39Ha02	CH_2Cl_2	1 REFERENCE
64Lu01	$\text{CH}_2(\text{OCH}_3)_2$ 66Lu01	2 REFERENCES

79Wu01	CH_3Cl					1 REFERENCE	
84Ra01	$(\text{CH}_3\text{CoO})_2 \cdot \text{CO}_4 \cdot \text{H}_2\text{O}$					1 REFERENCE	
79Wu01	CH_3F					1 REFERENCE	
22Bu01	CH_3I	$^{32}\text{Cr01}$	$^{39}\text{Ha02}$			3 REFERENCES	
75Da01	CH_3OH					1 REFERENCE	
33Me01	CH_4	$^{64}\text{Lu01}$	$^{64}\text{Ru01}$	$^{70}\text{De01}$	$^{70}\text{De03}$	$^{71}\text{Be01}$	10 REFERENCES
72St01		$^{73}\text{Le01}$	$^{75}\text{Da01}$	$^{77}\text{Le01}$			
70Ha02	CH_4O						1 REFERENCE
33Me01	C_2H_2	$^{85}\text{Wu01}$					2 REFERENCES
32Cr01	C_2H_4	$^{33}\text{Me01}$	$^{61}\text{Wi01}$	$^{73}\text{Le01}$	$^{74}\text{Mi01}$		5 REFERENCES
32Cr01	$\text{C}_2\text{H}_5\text{Br}$	$^{32}\text{St01}$	$^{39}\text{Ha02}$				3 REFERENCES
32Cr01	$\text{C}_2\text{H}_5\text{Cl}$						1 REFERENCE
32Cr01	$(\text{C}_2\text{H}_5)_2 \cdot \text{O}$						1 REFERENCE
66Lu01	$\text{C}_2\text{H}_5\text{OH}$	$^{75}\text{Da01}$					2 REFERENCES
74Mi01	$(\text{C}_2\text{H}_5)_3 \cdot \text{PO}_4$						1 REFERENCE
28Ku01	C_2H_6	$^{33}\text{Me01}$	$^{67}\text{He01}$	$^{73}\text{Le01}$			4 REFERENCES
71Be01	$\text{C}_2\text{H}_6\text{O}$						1 REFERENCE
22Ta01	$\text{C}_3\text{H}_6\text{O}$	$^{59}\text{Ma01}$					2 REFERENCES
22Ta01	$\text{C}_3\text{H}_6\text{O}_2$						1 REFERENCE

71Be01	C_3H_7O	1 REFERENCE
75Da01	C_3H_7OH	1 REFERENCE
33Me01	C_3H_8	1 REFERENCE
22Ta01	C_3H_3O	1 REFERENCE
22Ta01	$C_3H_8O_2$	1 REFERENCE
22Ta01	C_4H_8O	1 REFERENCE
73Le01	C_4H_{10}	1 REFERENCE
71Be01	$C_4H_{10}O$	1 REFERENCE
30Wo01	C_5H_{12} $^{32}Cr01$	2 REFERENCES
230101	$C_6H_3(CH_3)_3$	1 REFERENCE
230101	$C_6H_4(CH_3)_2$	1 REFERENCE
230101	$C_6H_5CH_3$	1 REFERENCE
22Ta01	C_6H_6 $^{220}101$	2 REFERENCES
230101	$C_6H_{12}O$	1 REFERENCE
32Cr01	C_6H_{14}	1 REFERENCE
22Ta01	C_7H_8	1 REFERENCE
230101	C_7H_{16}	1 REFERENCE
22Ta01	$C_{10}H_{16}$	1 REFERENCE

28Ku01	CO	33Me01	71Be01	71De03	73Le01	75Da01	79Ba01	7 REFERENCES
22Bu01	CO ₂	28Ku01	31De01	32Cr01	33Me01	62Bu01		11 REFERENCES
71Be01		71De03	72St01	74Mi01	79Ba01			
39Wr01	[(CO ₂) ₂ *Fe+2H ₂ O]							1 REFERENCE
39Wr01	CoCO ₃							1 REFERENCE
84Ra01	CoSO ₄ *7H ₂ O							1 REFERENCE
81Um01	CrO ₃							1 REFERENCE
39Wr01	Cr ₂ O ₃							1 REFERENCE
70Br01	CsCl							1 REFERENCE
710t01	CsF							1 REFERENCE
69Fu01	CsI	70Br01						2 REFERENCES
39Ha02	CS ₂							1 REFERENCE
81Um01	CuCl							1 REFERENCE
81Um01	CuO							1 REFERENCE
81Um01	CuO ₃							1 REFERENCE
84Ra01	CuSO ₄ *5H ₂ O							1 REFERENCE
64Co04	D	69No01	72Ra01					3 REFERENCES
35Ma01	D ₂ O	47Ma01	73Ka01	77Ph01				4 REFERENCES

82Um01	Dy_2O_3	84Um01				2 REFERENCES		
82Um01	Er_2O_3	84Um01				2 REFERENCES		
84Ra01	$FeSO_4 \cdot 7H_2O$					1 REFERENCE		
70Ca01	GaAs	84Ra01				2 REFERENCES		
70Ca01	GaP					1 REFERENCE		
70Ca01	GaSb					1 REFERENCE		
82Um01	Gd_2O_3	84Um01				2 REFERENCES		
51Gl01	$GeBr_4$					1 REFERENCE		
51Gl01	$GeCl_4$					1 REFERENCE		
51Gl01	GeH_4					1 REFERENCE		
51Gl01	Ge_2H_6					1 REFERENCE		
72Ha01	HCl	74Mi01				2 REFERENCES		
63Ch01	$(HCoO)_2 \cdot Pb$	82Um01	84Um01			3 REFERENCES		
69Be01	HF	69Be02				2 REFERENCES		
84Ra01	HgI_2					1 REFERENCE		
21He01	H_2O (Water)	22Ta01	230I01	32Ch01	35Ge02	35Ma01	47Ma01	35 REFERENCES
52Wy01		53Gh01	54Pa01	57Ma01	58Wo01	60Wy01	62Ba02	
63Sc01		64Te01	65Th01	67Ka01	69Be01	69Be02	69We01	
70De03		71Be01	73Ka01	74Jo01	74Su01	75Ah01	75Ph01	
75Ra01		77Ph01	78Pe01	83Sn02	84Ra01	85Bi01	86Br01	

32Cr01	H ₂ S 67He01	69La01	72Ha01	72St01	74Mi01	75Da01	7 REFERENCES
82Um01	Ho ₂ O ₃ 84Um01						2 REFERENCES
70Ca01	InAs						1 REFERENCE
70Ca01	InP						1 REFERENCE
70Ca01	InSb 84Ra01						2 REFERENCES
70Br01	KBr 81Um01						2 REFERENCES
84Ra01	KBrO ₃						1 REFERENCE
81Um01	KCl						1 REFERENCE
81Um01	KH ₂ PO ₄ 84Ra01						2 REFERENCES
69Fu01	KI 70Br01	81Um01	84Um01				4 REFERENCES
84Ra01	KNO ₃						1 REFERENCE
84Ra01	K ₂ Cr ₂ O ₇						1 REFERENCE
39Wr01	K ₂ TeO ₃						1 REFERENCE
82Um01	La ₂ O ₃ 84Um01						2 REFERENCES
65Pr01	LiD						1 REFERENCE
39Wr01	LiF 76Cr01	76La01					3 REFERENCES
82Ba01	LiF:Mg,Ti(TLD 600)						1 REFERENCE
82Ba01	LiF:Mg,Ti(TLD 700)						1 REFERENCE

82Ba01	LiF-7(Teledyne)	1 REFERENCE
65Pr01	LiH 69De02	2 REFERENCES
81Um01	LiOH	1 REFERENCE
82Ba01	Li ₂ B ₄ O ₇ :Mn(TLD 800)	1 REFERENCE
81Um01	MgO	1 REFERENCE
39Wr01	MnO ₂ 81Um01	2 REFERENCES
84Ra01	MnSO ₄ *H ₂ O	1 REFERENCE
59Ba01	NaCl 76Cr01 81Um01 84Ra01	4 REFERENCES
76Cr01	NaF 81Um01	2 REFERENCES
81Um01	NaHCO ₃	1 REFERENCE
54Ho01	NaI 54Pa01 63Sc01 69Fu01 76Ma01	5 REFERENCES
81Um01	NaNO ₂	1 REFERENCE
81Um01	NaNO ₃ 84Ra01	2 REFERENCES
84Ra01	NaWO ₄ *2H ₂ O	1 REFERENCE
84Ra01	Na ₂ B ₄ O ₇ *10H ₂ O	1 REFERENCE
81Um01	Na ₂ CO ₃	1 REFERENCE
81Um01	Na ₂ SO ₄	1 REFERENCE
82Um01	Nd ₂ O ₃ 84Um01	2 REFERENCES

70De03	NH_3	72St01	75Da01			3 REFERENCES		
39Wr01	NH_4Br					1 REFERENCE		
39Wr01	NH_4Cl					1 REFERENCE		
84Ra01	NH_4NO_3					1 REFERENCE		
39Wr01	NH_4VO_3					1 REFERENCE		
69Be01	N_2H_4	69Be02				2 REFERENCES		
81Um01	NiO					1 REFERENCE		
72St01	NO	71Be01	71De03	72St01	73Le01	75Da01	6 REFERENCES	
72St01	N_2O	71Be01	71De03	72St01	73Le01	75Da01	79Ba01	7 REFERENCES
58Bo01	PbTe	66Lu02					2 REFERENCES	
72Ha01	PH_3						1 REFERENCE	
82Um01	PrO_2						1 REFERENCE	
70Br01	RbCl	81Um01					2 REFERENCES	
39Wr01	Sb_2O_3						1 REFERENCE	
73Hr01	SeH_2						1 REFERENCE	
77Le01	SF_6						1 REFERENCE	
72Ha01	SiF_4						1 REFERENCE	
72Ha01	SiH_4						1 REFERENCE	

66Er01	SiO ₂	67Er01	67Er02	74Mi01	4 REFERENCES
82Um01	Sm ₂ O ₃	84Um01			2 REFERENCES
66Lu02	SnTe				1 REFERENCE
22Bu01	SO ₂	30Co01	30Wo01	32St01	4 REFERENCES
81Um01	SrF ₂				1 REFERENCE
84Ra01	Sr(NO ₃) ₂				1 REFERENCE
39Wr01	SrO				1 REFERENCE
82Um01	Ta ₂ O ₅	84Um01			2 REFERENCES
34Ra01	ThO ₂				1 REFERENCE
31Um01	TiO ₂	84Ra01			2 REFERENCES
70Ma01	UO ₂				1 REFERENCE
84Ra01	UO ₂ (CoO) ₂ *3H ₂ O				1 REFERENCE
70Fi01	VB ₂				1 REFERENCE
70Fi01	VC				1 REFERENCE
70Fi01	VN				1 REFERENCE
70Fi01	V ₂ O ₃				1 REFERENCE
70Fi01	V ₂ O ₄				1 REFERENCE
70Fi01	V ₂ O ₅				1 REFERENCE

84Ra01	ZnO					1 REFERENCE
84Ra01	ZnTe					1 REFERENCE
32Cr01	Zr(CH ₃) ₂					1 REFERENCE
39Wr01	ZrO ₂	81Um01				2 REFERENCES
22Ta01	Acetone					1 REFERENCE
22Bu01	Air	28Ku01	29Sc01	30Wo01	31De01	13 REFERENCES
32St01		33Me01	54Cu01	70Mc02	74Mi01	32Cr01
					76Ha02	
71Go01	Anisole					1 REFERENCE
74Jo01	Aorta					1 REFERENCE
70Ma01	Asphalt					1 REFERENCE
86Si01	Bell Metal					1 REFERENCE
71Go01	Benzene					1 REFERENCE
75Ra01	Blood					1 REFERENCE
75Ph01	Biological Materials (30)					1 REFERENCE
86Br01	Bone Standard					1 REFERENCE
74Jo01	Brain	75Ra01				2 REFERENCES
86Si01	Brass					1 REFERENCE
58Sa01	Carbon Steel					1 REFERENCE

74Jo01	Cartilage	1 REFERENCE
36Bi01	Cellophane	1 REFERENCE
69Se01	Claryl	1 REFERENCE
86Br01	Coconut Oil	1 REFERENCE
57Ma01	Concrete	3 REFERENCES
	62Ba02	
	67Ka01	
86Br01	Corn Oil	1 REFERENCE
58Sa01	Cr Steel	1 REFERENCE
71Go01	Cyclohexane	1 REFERENCE
71Go01	Decalin	1 REFERENCE
86Br01	Dried Lean Meat	1 REFERENCE
86Br01	Dry Bone	1 REFERENCE
75Ra01	Egg White	1 REFERENCE
75Ra01	Egg Yolk	1 REFERENCE
35Ma01	Ethyl Alcohol	1 REFERENCE
74Jo01	Fat	2 REFERENCES
	86Br01	
81Da01	Formvar	1 REFERENCE
86Br01	Ghee	1 REFERENCE
67Ka01	Glass	1 REFERENCE

86Si01	Gun Metal	1 REFERENCE
74Jo01	Kidney	1 REFERENCE
81Da01	Kimfoil	1 REFERENCE
86Si01	Linotype Metal	1 REFERENCE
74Jo01	Liver 75Ra01	2 REFERENCES
78Pe01	Lucite	1 REFERENCE
74Jo01	Lungs	1 REFERENCE
67Ka01	Magnetite Concrete	1 REFERENCE
69Se01	Makrofol	1 REFERENCE
70Ma01	Marble	1 REFERENCE
70Ma01	Masonite	1 REFERENCE
69Se01	Melinex 70De02	2 REFERENCES
75Lo01	Methane	1 REFERENCE
75Ra01	"Mix-D"	1 REFERENCE
58Sa01	Mn Steel	1 REFERENCE
53Sa01	Monel Metal	1 REFERENCE
60Eh01	Mylar 66He01 69Se01	3 REFERENCES
75Ra01	Normal and Cancerous Tissue	1 REFERENCE

71Go01	O-Xylene	1 REFERENCE
30Ta01	Paraffin	6 REFERENCES
	32Cr01 34Gr01 34Ha01 70Ma01 71Go01	
74Ca01	Parylene C	1 REFERENCE
71Go01	P-Cymene	1 REFERENCE
58Sa01	Perspex(Lucite($C_5H_8O_2$))	1 REFERENCE
58Sa01	Phosphor Bronze	1 REFERENCE
71Go01	Plastic Scintillator	1 REFERENCE
65Th01	Plexiglass	3 REFERENCES
	70Ma01 75Ra01	
86Si01	Plumber Solder	1 REFERENCE
52Co01	Polyethylene	4 REFERENCES
	60Eh01 78Pe01 86Br01	
86Br01	Polyisoprene	1 REFERENCE
70De02	Polypropylene(C_3H_6) _n	2 REFERENCES
	81Da01	
58Ba01	Polystyrene	6 REFERENCES
	65Th01 67Er01 67Er02 74Ca01 75Ra01	
70Ma01	Porcelain	1 REFERENCE
65Th01	Presdwood	1 REFERENCE
70Ma01	Rubber	1 REFERENCE
74Jo01	Skin	1 REFERENCE
86Si01	Solder	1 REFERENCE

86Si01	Solder Soft	1 REFERENCE
60Eh01	Stainless Steel 65Th01 70Ma01	3 REFERENCES
74Jo01	Striated Muscle	1 REFERENCE
64Te01	Teflon(CF ₂) 70Ma01	2 REFERENCES
69Se01	Terphane	1 REFERENCE
74Jo01	Testes	1 REFERENCE
74Jo01	Thyroid	1 REFERENCE
71Go01	Toluene	1 REFERENCE
75Ra01	Various Muscle	1 REFERENCE
74Jo01	Vena Cava	1 REFERENCE
65Th01	W-Alloy	1 REFERENCE
58Sa01	W-Steel	1 REFERENCE
86Br01	Wax	1 REFERENCE
85Pe01	A-150 Dosimetry-Phantom Plastic	1 REFERENCE
85Pe01	A-174 Dosimetry-Phantom Plastic	1 REFERENCE
85Pe01	A-180 Dosimetry-Phantom Plastic	1 REFERENCE
85Pe01	B-100 Dosimetry-Phantom Plastic	1 REFERENCE
85Pe01	B-109 Dosimetry-Phantom Plastic	1 REFERENCE

85Pe01	B-110 Dosimetry-Phantom Plastic	1 REFERENCE
85Pe01	C-552 Dosimetry-Phantom Plastic	1 REFERENCE
75Lo01	P-10 Gas	1 REFERENCE
86Si01	40Pb-60Sn	1 REFERENCE
86Si01	50Pb-50Sn	1 REFERENCE
86Si01	66Cu-34Zn	1 REFERENCE
86Si01	67Pb-33Sn	1 REFERENCE
86Si01	75Cu-25Sn	1 REFERENCE
86Si01	79Pb-16Sb-5Sn	1 REFERENCE
86Si01	86Cu-10Sn-4Zn	1 REFERENCE

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11. ABSTRACT <i>(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)</i> <p>We present a bibliography of papers reporting absolute measurements of photon (XUV, x-ray, gamma-ray, bremsstrahlung) total interaction cross sections or attenuation coefficients for the elements and some compounds. The energy range covered is from 10 eV to above 10 GeV. These papers are part of the reference collection of the National Bureau of Standards Photon and Charged Particle Data Center. They cover the period from 1907 to March 1986. Included with each reference are annotations specifying the substances studied and the energy range covered. The bibliography includes about 500 non-duplicative references to a total of about 20,000 data points. All these data are available in machine-readable form.</p>			
12. KEY WORDS <i>(Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)</i> <p style="text-align: center;">attenuation coefficient, cross section, bibliography, data base, gamma rays, photons, x rays.</p>			
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