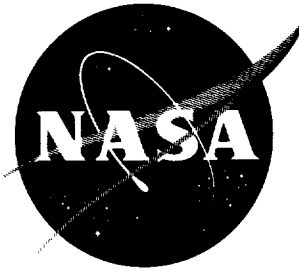


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TECHNICAL NOTE

D-1791

TABULATED VALUES OF BOND DISSOCIATION ENERGIES,
IONIZATION POTENTIALS, AND ELECTRON AFFINITIES
FOR SOME MOLECULES FOUND IN HIGH-TEMPERATURE
CHEMICAL REACTIONS

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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SUMMARY

Values of the bond dissociation energies, ionization potentials, and electron affinities that were taken from the literature are presented in tables for some monatomic, diatomic, and polyatomic molecules which are found in many high-temperature chemical reactions including combustion reactions.

Much of the information came from literature published after 1950 which either reported experimental and theoretical energy values or gave a review of previous literature on the subject. In some cases values for the bond dissociation energies were calculated from recently published heats of formation.

INTRODUCTION

In recent years there has been an increasing interest in knowing the values of bond dissociation energies for diatomic and polyatomic molecules along with ionization potentials and electron affinities for monatomic, diatomic, and polyatomic molecules. These values have been needed by both chemists and physicists when studying chemical reactions at high temperatures, especially when the equilibrium constants had to be calculated for dissociation and ionization of molecules. Use of the ionization potentials and electron affinities of molecules has been made in determining the best materials for adding or removing free electrons in high-temperature gas streams, with applications in the study of magnetohydrodynamic generators and radio attenuation in plasmas.

The primary purpose of this investigation is to tabulate values obtained from existing literature for bond dissociation energies, ionization potentials, and electron affinities for many species present in gas streams as the result of combustion, shock-wave compression, and high-energy electrical discharges or as the result of "seeding" the gas streams with various materials for the production or removal of free electrons. The survey was made by using many values that were reported in recent literature by the individuals who measured the values and also

by using values listed in recent reviews on the subject of dissociation, ionization, and electron affinity.

Many references in the literature have dealt with the structure of molecules as related to the dissociation energy or strength of chemical bonds. Among those studies were references 1 to 5. Several of these, such as references 1, 4, and 5, were surveys of the literature and contained lists of the best available values for the dissociation energies of molecules - both diatomic and polyatomic. Studies on the ionization phenomena in gases have appeared in references such as references 6 to 8 whereas references 9 and 10 are reviews of the ionization potential values for a large number of molecules. The study of negative ions as related to the electron affinity of molecules has been dealt with in references such as references 7 and 11 and reference 12 is a review of the electron affinity values for molecules that were known at the time the reference was written.

RESULTS AND DISCUSSION

In tables I, II, and III are presented values of bond dissociation energies, ionization potentials, and electron affinities which have been obtained from existing literature or calculated by use of information in existing literature. (See refs. 1, 4, 5, 6, 9, and 10 to 113.) Where the energy values presented in the tables are not followed by quoted errors, the values are correct to the number of significant figures given or the authors did not report the size of the errors. Parentheses are used to denote approximate values.

The bond dissociation energy values from the literature are presented in table I along with the names of the molecules that are decomposed, the reactions showing the products formed, and the references from which the energy values were obtained. These values are sometimes referred to as $D(A-B)$ and correspond in thermal measurements to ΔE_0^0 , the heat of the gas-phase reaction $AB \rightleftharpoons A + B$ which occurs under ideal gas conditions and at a temperature of 0°K and produces molecules A and B in their ground states. The symbol A in this reaction can be one atom or a group of atoms. When diatomic molecules are considered, $D(A-B)$ is replaced by D_0^0 , the dissociation energy, where the subscript refers to the zeroeth vibrational level and the superscript to the products in their ground states. In some cases ΔH_{298}^0 , which is the change in enthalpy or heat content at 298°K , is used for $D(A-B)$. This value will be on the order of 1 to 2 kcal/mole (0.04 to 0.09 ev) larger than the true bond dissociation energy but usually the errors involved in the determinations do not warrant any changes in the value of ΔH_{298}^0 to get ΔH_0^0 .

The bond energy E should not be confused with the bond dissociation energy since bond energy is defined as the strength of a bond as it exists in a molecule before dissociation and is usually found by dividing the atomic heat of formation (heat of atomization) of the molecule AB_n by the number of bonds n present, provided that all the B's are identical. A discussion of the bond energy compared with the dissociation energy can be found in reference 5. In diatomic molecules

the bond energy is the same as the dissociation energy but in polyatomic molecules this is not true because after the primary bond is broken the strengths of the remaining bonds may change as shown in table I for methane CH_4 where the energies needed to break each of the bonds are 4.40, 3.8, 5.4, and 3.47 ev, respectively, whereas the bond energy value $E(\text{C-H})$ for CH_4 is on the order of 4.31 ev.

For some reactions shown in table I the dissociation energy values were not found in the literature but were calculated by using the following equation:

$$D(\text{A-B}) = \Delta H_f^\circ(\text{A}) + \Delta H_f^\circ(\text{B}) - \Delta H_f^\circ(\text{AB}) \quad (1)$$

based on the reaction $\text{AB} \rightleftharpoons \text{A} + \text{B}$ where ΔH_f° refers to the heat of formation for the various gaseous species at 0°K . The values for heats of formation may be found in literature such as references 13 and 14 which deal with thermochemical data pertaining to the combustion of fuels.

Tabulated values from the literature for the ionization potentials of atoms and molecules are presented in table II along with the names and formulas of the neutral species and the appropriate references. The term ionization potential refers to the energy needed to remove the most loosely bound electron from the neutral species in its ground state to form the corresponding molecule-ion or atomic ion also in the ground state. For some of the molecules the method used to determine the value is indicated; that is, spectroscopic technique, photo-ionization technique, or electron impact technique. These methods produce values which are listed for many molecules as a form of comparison. For the atoms the second ionization potential values are included and they refer to the energy required to remove an electron from a singly charged atom in its ground state.

The electron affinity values for several atoms and molecules are presented in table III along with the names and formulas of the neutral species and the references from which they were obtained. The term electron affinity refers to the energy released when an electron is attached to a neutral monatomic, diatomic, or polyatomic molecule and a negative ion is formed. In this case the lowest vibration-rotational level for the ground electronic state of the negative ion is below that of the corresponding neutral molecule and the difference in energy between the two states is called the electron affinity. Only molecules with positive electron affinity values are given since these molecules are considered to be important in reducing the free-electron content of a high-temperature gas stream. For the most part, the molecules with negative electron affinity values form unstable negative ions. In reference 12 some of the electron affinity values are calculated from heats of formation at 298°K . These values were not changed since the errors already present in most of the determinations were much larger.

CONCLUDING REMARKS

Bond dissociation energies, ionization potentials, and electron affinity values are presented in tables for some monatomic, diatomic, and polyatomic molecules that are found in high-temperature chemical reactions. These values come from literature published as late as September 1962.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Station, Hampton, Va., March 22, 1963.

REFERENCES

1. Herzberg, Gerhard: Molecular Spectra and Molecular Structure. I. Spectra of Diatomic Molecules. Second ed., D. Van Nostrand Co., Inc., c.1950.
2. Herzberg, Gerhard: Molecular Spectra and Molecular Structure. II. Infrared and Raman Spectra of Polyatomic Molecules. D. Van Nostrand Co., Inc., c.1945.
3. Pauling, Linus: The Nature of the Chemical Bond. Third ed., Cornell Univ. Press (Ithaca, N.Y.), 1960.
4. Gaydon, A. G.: Dissociation Energies. Second ed. rev., Chapman & Hall Ltd. (London), 1953.
5. Cottrell, T. L.: The Strengths of Chemical Bonds. Second ed., Butterworths Sci. Pub. (London), 1958.
6. Francis, Gordon: Ionization Phenomena in Gases. Academic Press, Inc. (New York), 1960.
7. Loeb, Leonard B.: Basic Processes of Gaseous Electronics. Univ. of California Press, 1955.
8. Massey, H. S. W., and Burhop, E. H. S.: Electronic and Ionic Impact Phenomena. The Clarendon Press (Oxford), 1952.
9. Field, F. H., and Franklin, J. L.: Electron Impact Phenomena. Academic Press, Inc. (New York), 1957.
10. Watanabe, K., Nakayama, T., and Mottl, J.: Ionization Potential of Molecules by a Photoionization Method. Contract No. DA-04-200-ORD 480 and 737, Dept. Phys., Univ. of Hawaii, Dec. 1959. (Available From ASTIA as AD No. 231 889.)
11. Massey, H. S. W.: Negative Ions. Second ed., Cambridge Univ. Press, 1950.
12. Pritchard, H. O.: The Determination of Electron Affinities. Chem. Rev., vol. 52, no. 3, June 1953, pp. 529-563.
13. Anon.: JANAF Thermochemical Tables. Contract No. AF33(616)-6149, Thermal Lab., The Dow Chemical Co., June 30, 1962.
14. Sarner, Stanley F., and Warlick, Doris L.: Thermodynamic Properties of Combustion Products. Vol. 3. Tech. Inf. Ser. No. R59FPD796 (Contract NORD 18508 (FEM)), Flight Propulsion Lab. Dept., Gen. Elec. Co., June 14, 1960.
15. Kennedy, Al, and Colburn, Charles B.: Strength of the N-F Bonds in NF_3 and of N-F and N-N Bonds in N_2F_4 . Jour. Chem. Phys., vol. 35, no. 5, Nov. 1961, pp. 1892-1893.

16. Knight, Herbert T., and Rink, John P.: Dissociation Energy of Cyanogen and Related Quantities by X-Ray Densitometry of Shock Waves. *Jour. Chem. Phys.*, vol. 35, no. 1, July 1961, pp. 199-208.
17. Brewer, Leo, Hicks, W. T., and Krikorian, O. H.: Heat of Sublimation and Dissociation Energy of Gaseous C_2 . *Jour. Chem. Phys.*, vol. 36, no. 1, Jan. 1, 1962, pp. 182-188.
18. Edlén, B.: Isoelectronic Extrapolation of Electron Affinities. *Jour. Chem. Phys.*, vol. 33, no. 1, July 1960, pp. 98-100.
19. Curran, R. K.: Low-Energy Process for F^- Formation in SF_6 . *Jour. Chem. Phys.* (Letters to the Editor), vol. 34, no. 3, Mar. 1961, p. 1069.
20. Curran, R. K., and Fox, R. E.: Mass Spectrometer Investigation of Ionization of N_2O by Electron Impact. *Jour. Chem. Phys.*, vol. 34, no. 5, May 1961, pp. 1590-1594.
21. Fox, R. E., and Curran, R. K.: Ionization Processes in CCl_4 and SF_6 by Electron Beams. *Jour. Chem. Phys.*, vol. 34, no. 5, May 1961, pp. 1595-1601.
22. Morrison, J. D., Hurzeler, H., Inghram, Mark G., and Stanton, H. E.: Threshold Law for the Probability of Excitation of Molecules by Photon Impact. A Study of the Photoionization Efficiencies of Br_2 , I_2 , HI , and CH_3I . *Jour. Chem. Phys.*, vol. 33, no. 3, Sept. 1960, pp. 821-824.
23. Herron, John T., and Dibeler, Vernon H.: Ionization Potential of Fluorine. *Jour. Chem. Phys.* (Letters to the Editor), vol. 32, no. 6, June 1960, pp. 1884-1885.
24. Branscomb, Lewis M., Burch, David S., Smith, Stephen J., and Geltman, Sydney: Photodetachment Cross Section and the Electron Affinity of Atomic Oxygen. *Phys. Rev.*, Second ser., vol. 111, no. 2, July 15, 1958, pp. 504-513.
25. Thomas, N., Gaydon, A. G., and Brewer, L.: Cyanogen Flames and the Dissociation Energy of N_2 . *Jour. Chem. Phys.*, vol. 20, no. 3, Mar. 1952, pp. 369-374.
26. Schulz, G. J.: Study of the N_2O Molecule Using Electron Beams. *Jour. Chem. Phys.*, vol. 34, no. 5, May 1961, pp. 1778-1781.
27. Somayajulu, G. R.: Dissociation Energies of Diatomic Molecules. *Jour. Chem. Phys.*, vol. 33, no. 5, Nov. 1960, pp. 1541-1553.
28. James, C. G., and Sugden, T. M.: Photometric Investigations of Alkali Metals in Hydrogen Flame Gases - I. A General Survey of the Use of Resonance Radiation in the Measurement of Atomic Concentrations. *Proc. Roy. Soc. (London)*, ser. A, vol. 227A, no. 1170, Jan. 20, 1955, pp. 312-329.

29. Curran, R. K.: Positive and Negative Ion Formation in CCl_3F . Jour. Chem. Phys., vol. 34, no. 6, June 1961, pp. 2007-2010.
30. Drowart, J., DeMaria, G., Burns, R. P., and Inghram, M. G.: Thermodynamic Study of Al_2O_3 Using a Mass Spectrometer. Jour. Chem. Phys., vol. 32, no. 5, May 1960, pp. 1366-1372.
31. Lindeman, L. P., and Guffy, J. C.: Determination of the O-O Bond Energy in Hydrogen Peroxide by Electron Impact. Jour. Chem. Phys. (Letters to the Editor), vol. 29, no. 1, July 1958, pp. 247-248.
32. Thorburn, R.: Ionization and Dissociation by Electron Impact in Fluorine, Hydrogen Fluoride, Chlorine and Hydrogen Chloride. Proc. Phys. Soc. (London), vol. 73, pt. 1, no. 469, Jan. 1, 1959, pp. 122-126.
33. Drowart, J., Burns, R. P., DeMaria, G., and Inghram, Mark G.: Mass Spectrometric Study of Carbon Vapor. Jour. Chem. Phys. (Letters to the Editor), vol. 31, no. 4, Oct. 1959, pp. 1131-1132.
34. Benson, Sidney W., and Axworthy, Arthur E., Jr.: Mechanism of the Gas Phase, Thermal Decomposition of Ozone. Jour. Chem. Phys., vol. 26, no. 6, June 1957, pp. 1718-1726.
35. Rees, A. L. G.: Electronic Spectrum and Dissociation Energy of Fluorine. Jour. Chem. Phys., vol. 26, no. 6, June 1957, pp. 1567-1571.
36. Burch, D. S., Smith, S. J., and Branscomb, L. M.: Photodetachment of O_2^- . Phys. Rev., Second ser., vol. 112, no. 1, Oct. 1, 1958, pp. 171-175.
37. Dibeler, Vernon H., Reese, Robert M., and Franklin, J. L.: Mass Spectrometric Study of Cyanogen and Cyanoacetylenes. Jour. American Chem. Soc., vol. 83, no. 8, Apr. 20, 1961, pp. 1813-1818.
38. Herron, John T., and Dibeler, Vernon H.: Electron Impact Study of Cyanogen Halides. Jour. American Chem. Soc., vol. 82, no. 7, Apr. 5, 1960, pp. 1555-1559.
39. Stevenson, D. P.: Ionization and Dissociation by Electron Impact: Cyanogen, Hydrogen Cyanide, and Cyanogen Chloride and the Dissociation Energy of Cyanogen. Jour. Chem. Phys., vol. 18, no. 10, Oct. 1950, pp. 1347-1351.
40. Foner, S. N., and Hudson, R. L.: Ionization Potential of the Free HO_2 Radical and the H- O_2 Bond Dissociation Energy. Jour. Chem. Phys. (Letters to the Editor), vol. 23, no. 7, July 1955, pp. 1364-1365.
41. Farmer, J. B., Henderson, I. H. S., Lossing, F. P., and Marsden, D. G. H.: Free Radicals by Mass Spectrometry. IX. Ionization Potentials of CF_3 and CCl_3 Radicals and Bond Dissociation Energies in Some Derivatives. Jour. Chem. Phys., vol. 24, no. 2, Feb. 1956, pp. 348-352.

42. Foner, S. N., and Hudson, R. L.: Mass Spectrometric Detection of Triazene and Tetrazene and Studies of the Free Radicals NH_2 and N_2H_3 . Jour. Chem. Phys. (Letters to the Editor), vol. 29, no. 2, Aug. 1958, pp. 442-443.
43. Dibeler, Vernon H., Reese, Robert M., and Franklin, J. L.: Ionization and Dissociation of Oxygen Difluoride by Electron Impact. Jour. Chem. Phys., vol. 27, no. 6, Dec. 1957, pp. 1296-1297.
44. Koski, W. S., Kaufman, Joyce J., Pachucki, C. F., and Shipko, F. J.: A Mass Spectrometric Appearance Potential Study of Isotopically Labeled Diboranes. Jour. American Chem. Soc., vol. 80, no. 13, July 5, 1958, pp. 3202-3207.
45. Knox, Bruce E., and Palmer, Howard B.: Bond Dissociation Energies in Small Hydrocarbon Molecules. Chem. Rev., vol. 61, no. 2, June 1961, pp. 247-255.
46. Lindeman, L. P., and Guffy, J. C.: Recalculation of $D(\text{HO}-\text{OH})$ Based on New Value of $D(\text{O}-\text{H})$. Jour. Chem. Phys. (Letters to the Editor), vol. 30, no. 1, Jan. 1959, pp. 322-323.
47. Honig, Richard E.: Mass Spectrometric Study of the Molecular Sublimation of Graphite. Jour. Chem. Phys., vol. 22, no. 1, Jan. 1954, pp. 126-131.
48. Bulewicz, E. M., Phillips, L. F., and Sugden, T. M.: Determination of Dissociation Constants and Heats of Formation of Simple Molecules by Flame Photometry. Part 8.-Stabilities of the Gaseous Diatomic Halides of Certain Metals. Trans. Faraday Soc., vol. 57, pt. 6, no. 462, June 1961, pp. 921-931.
49. Steiner, Bruce, Giese, Clayton F., and Inghram, Mark G.: Photoionization of Alkanes. Dissociation of Excited Molecular Ions. Jour. Chem. Phys., vol. 34, no. 1, Jan. 1961, pp. 189-220.
50. Reed, Rowland I., and Snedden, Walter: Studies in Electron Impact Methods. Part 6.-The Formation of the Methine and Carbon Ions. Trans. Faraday Soc., vol. 55, pt. 6, no. 438, June 1959, pp. 876-879.
51. Lossing, F. P., and DeSouza, J. B.: Free Radicals by Mass Spectrometry. XIV. Ionization Potentials of Propyl and Butyl Free Radicals. Jour. American Chem. Soc., vol. 81, no. 2, Jan. 20, 1959, pp. 281-285.
52. Dibeler, Vernon H., Reese, Robert M., and Mann, D. E.: Ionization and Dissociation of Perchlorylfluoride by Electron Impact. Jour. Chem. Phys., vol. 27, no. 1, July 1957, pp. 176-179.
53. Brewer, Leo, and Brackett, Elizabeth: The Dissociation Energies of Gaseous Alkali Halides. Chem. Rev., vol. 61, no. 4, Aug. 1961, pp. 425-432.
54. Robertson, N. C., and Pease, R. N.: Heat of Dissociation of Cyanogen. Jour. Chem. Phys. (Letters to the Editor), vol. 10, no. 7, July 1942, p. 490.

55. Glockler, G.: Heats of Dissociation of Cyanogen. Jour. Chem. Phys., vol. 16, no. 6, June 1948, pp. 600-601.
56. La Paglia, S. R., and Duncan, A. B. F.: Vacuum Ultraviolet Absorption Spectrum and Dipole Moment of Nitrogen Trifluoride. Jour. Chem. Phys., vol. 34, no. 3, Mar. 1961, pp. 1003-1007.
57. Herron, John T., and Dibeler, Vernon H.: Mass Spectrum and Appearance Potentials of Tetrafluorohydrazine. Jour. Chem. Phys. (Letters to the Editor), vol. 33, no. 5, Nov. 1960, pp. 1595-1596.
58. DeMaria, G., Burns, R. P., Drowart, J., and Inghram, M. G.: Mass Spectrometric Study of Gaseous Molybdenum, Tungsten, and Uranium Oxides. Jour. Chem. Phys., vol. 32, no. 5, May 1960, pp. 1373-1377.
59. Margrave, John L.: Ionization Potentials of B_5H_9 , B_5H_8I , $B_{10}H_{14}$, and $B_{10}H_{13}C_2H_5$ From Electron Impact Studies. Jour. Chem. Phys. (Letters to the Editor), vol. 32, no. 6, June 1960, p. 1889.
60. Craggs, J. D., and Massey, H. S. W.: The Collisions of Electrons With Molecules. Encyclopedia of Phys., vol. XXXVII/1, Atoms III - Molecules I, S. Flügge, ed., Springer-Verlag (Berlin), 1959, pp. 314-415.
61. Johns, J. W. C., and Barrow, R. F.: The Band Spectrum of Silicon Monofluoride, SiF. Proc. Phys. Soc. (London), vol. 71, pt. 3, Mar. 1958, pp. 476-484.
62. Harrison, A. G., and Lossing, F. P.: Free Radicals by Mass Spectrometry. XVII. Ionization Potential and Heat of Formation of Vinyl Radical. Jour. American Chem. Soc., vol. 82, no. 3, Feb. 5, 1960, pp. 519-521.
63. Dibeler, Vernon H., Franklin, J. L., and Reese, Robert M.: Electron Impact Studies of Hydrazine and Methyl-Substituted Hydrazines. Jour. American Chem. Soc., vol. 81, no. 1, Jan. 5, 1959, pp. 68-73.
64. Koski, W. S., Kaufman, Joyce J., and Pachucki, C. F.: A Mass Spectroscopic Appearance Potential Study of Some Boron Trihalides. Jour. American Chem. Soc., vol. 81, no. 6, Mar. 20, 1959, pp. 1326-1331.
65. Pottie, R. F., Harrison, A. G., and Lossing, F. P.: Free Radicals by Mass Spectrometry. XXIV. Ionization Potentials of Cycloalkyl Free Radicals and Cycloalkanes. Jour. American Chem. Soc., vol. 83, no. 15, Aug. 5, 1961, pp. 3204-3206.
66. Berkowitz, J.: Correlation Scheme for Diatomic Oxides. Jour. Chem. Phys. (Letters to the Editor), vol. 30, no. 3, Mar. 1959, pp. 858-860.
67. Brewer, Leo: The Thermodynamic Properties of the Oxides and Their Vaporization Processes. Chem. Rev., vol. 52, no. 1, Feb. 1953, pp. 1-75.

68. Brewer, Leo, and Rosenblatt, Gerd M.: Dissociation Energies of Gaseous Metal Dioxides. *Chem. Rev.*, vol. 61, no. 2, June 1961, pp. 257-263.
69. Barrow, R. F.: Dissociation Energies of the Gaseous Mono-Halides of Boron, Aluminium, Gallium, Indium and Thallium. *Trans. Faraday Soc.*, vol. 56, pt. 7, no. 451, July 1960, pp. 952-958.
70. Majer, J. R., Patrick, C. R., and Robb, J. C.: Appearance Potentials of the Acetyl Radical-Ion. *Trans. Faraday Soc.*, vol. 57, pt. 1, no. 457, Jan. 1961, pp. 14-22.
71. Gowenlock, B. G., Jones, P. Pritchard, and Majer, J. R.: Bond Dissociation Energies in Some Molecules Containing Alkyl Substituted CH_3 , NH_2 and OH . *Trans. Faraday Soc.*, vol. 57, pt. 1, no. 457, Jan. 1961, pp. 23-27.
72. Reed, T. M., III: The Ionization Potential and the Polarizability of Molecules. *Jour. Phys. Chem.*, vol. 59, no. 5, May 17, 1955, pp. 428-432.
73. Branscomb, Lewis M., and Smith, Stephen J.: Electron Affinity of Atomic Sulfur and Empirical Affinities of the Light Elements. *Jour. Chem. Phys.* (Letters to the Editor), vol. 25, no. 3, Sept. 1956, pp. 598-599.
74. Phelps, A. V., and Pack, J. L.: Collisional Detachment in Molecular Oxygen. *Phys. Rev. Letters*, vol. 6, no. 3, Feb. 1, 1961, pp. 111-113.
75. Tsang, Wing, Bauer, S. H., and Cowperthwaite, M.: Dissociation Energy and Rate of Decomposition of C_2N_2 . *Jour. Chem. Phys.*, vol. 36, no. 7, Apr. 1, 1962, pp. 1768-1775.
76. Seman, Michael L., and Branscomb, Lewis M.: Structure and Photodetachment Spectrum of the Atomic Carbon Negative Ion. *Phys. Rev.*, Second ser., vol. 125, no. 5, Mar. 1, 1962, pp. 1602-1608.
77. Matsunaga, F. M.: Photoionization Yield of Several Molecules in the Schumann Region. *Sci. Rep. 3* (Contract No. AF-19(604)-4576), Univ. of Hawaii, Nov. 1961.
78. Gray, Dwight E., coordinating ed.: American Institute of Physics Handbook. McGraw-Hill Book Co., Inc., 1957.
79. Gordon, John S.: Thermodynamics of High-Temperature Gas Mixtures, and Application to Combustion Problems. WADC Tech. Rep. 57-33, ASTIA Doc. No. 110735, U.S. Air Force, Jan. 1957.
80. Cubicciotti, Daniel: Lattice Energies of the Alkali Halides and the Electron Affinities of the Halogens. *Jour. Chem. Phys.*, vol. 31, no. 6, Dec. 1959, pp. 1646-1651. (Erratum issued vol. 34, no. 6, June 1961, p. 2189.)
81. Buchanan, Robert Sylvester: Study of a Seeded Plasma. Ph. D. Dissertation, Univ. of Michigan, 1961. (Available From ASTIA as AD 261 920.)

82. Marsden, D. G. H.: Dissociation Energies of SO and S₂. Jour. Chem. Phys. (Letters to the Editor), vol. 31, no. 4, Oct. 1959, pp. 1144-1145.
83. Margrave, John L.: Ionization Potentials for C₂F₄, C₂F₃Cl, and C₂F₂Cl₂ and the Appearance Potential of CF₂⁺ From C₂F₄. Jour. Chem. Phys. (Letters to the Editor), vol. 31, no. 5, Nov. 1959, p. 1432.
84. Herron, John T., and Dibeler, Vernon H.: Mass Spectrometric Study of NF₂, NF₃, N₂F₂, and N₂F₄. Paper 65A5-120, Jour. Res. Nat. Bur. Standards, vol. 65A, no. 5, Sept.-Oct. 1961, pp. 405-409.
85. Reed, Rowland I., and Snedden, Walter: Studies in Electron Impact Methods. Part 2.-The Latent Heat of Sublimation of Carbon. Trans. Faraday Soc., vol. 54, pt. 3, no. 423, Mar. 1958, pp. 301-307.
86. Berkowitz, J.: Heat of Formation of the CN Radical. Jour. Chem. Phys., vol. 36, no. 10, May 15, 1962, pp. 2533-2539.
87. Taubert, R., and Lossing, F. P.: Free Radicals by Mass Spectrometry. XXVII. Ionization Potentials of Four Pentyl Radicals. Jour. American Chem. Soc., vol. 84, no. 9, May 5, 1962, pp. 1523-1526.
88. Page, F. M.: An Experimental Determination of the Electron Affinities of the Lower Alkyl Radicals. Eighth Symposium (International) on Combustion, The Williams & Wilkins Co. (Baltimore), 1962, pp. 160-164.
89. Reed, R. I., and Brand, J. C. D.: Electron Impact Studies. Part 4.-Glyoxal, Methylglyoxal, and Diacetyl. Trans. Faraday Soc., vol. 54, pt. 4, no. 424, Apr. 1958, pp. 478-482.
90. Foner, S. N., and Hudson, R. L.: Mass Spectrometry of the HO₂ Free Radical. Jour. Chem. Phys., vol. 36, no. 10, May 15, 1962, pp. 2681-2688.
91. Berry, R. Stephen, Reimann, Curt W., and Spokes, G. Neil: Absorption Spectrum of Gaseous Cl⁻ and Electron Affinity of Chlorine. Jour. Chem. Phys. (Letters to the Editor), vol. 35, no. 6, Dec. 1961, pp. 2237-2238.
92. Reese, Robert M., Dibeler, Vernon H., and Franklin, J. L.: Electron Impact Studies of Sulfur Dioxide and Sulfuryl Fluoride. Jour. Chem. Phys., vol. 29, no. 4, Oct. 1958, pp. 880-883.
93. Elder, Fred A., Giese, Clayton, Steiner, Bruce, and Inghram, Mark: Photo-Ionization of Alkyl Free Radicals. Jour. Chem. Phys., vol. 36, no. 12, June 15, 1962, pp. 3292-3296.
94. Mann, Marvin M., Hustrulid, Andrew, and Tate, John T.: The Ionization and Dissociation of Water Vapor and Ammonia by Electron Impact. Phys. Rev., Second ser., vol. 58, no. 4, Aug. 15, 1940, pp. 340-347.

95. Page, F. M.: Determination of Electron Affinities. Part 3.-The Amino Radical. Trans. Faraday Soc., vol. 57, pt. 8, no. 464, Aug. 1961, pp. 1254-1258.
96. Szwarc, M.: The Determination of Bond Dissociation Energies by Pyrolytic Methods. Chem. Rev., vol. 47, no. 1, Aug. 1950, pp. 75-173.
97. Bailey, T. L.: Experimental Determination of the Electron Affinity of Fluorine. Jour. Chem. Phys., vol. 28, no. 5, May 1958, pp. 792-798.
98. Margrave, John L., and Sthapitanonda, Prasom: Gaseous Metal Nitrides. I. Theoretical Dissociation Energies for Diatomic Nitrides. Jour. Phys. Chem. (Notes), vol. 59, no. 12, Dec. 1955, pp. 1231-1232.
99. Ansdell, D. A., and Page, F. M.: Determination of Electron Affinities. Part 4.-Electron Affinities of the Sulphydryl Radical and the Sulphur Atom. Trans. Faraday Soc., vol. 58, pt. 6, no. 474, June 1962, pp. 1084-1089.
100. Kiser, Robert W., and Hobrock, Brice G.: The Ionization Potential of Hydrogen Disulfide (H_2S_2). Jour. Phys. Chem. (Communications to the Editor), vol. 66, no. 6, June 1962, p. 1214.
101. Verhaegen, G., and Drowart, J.: Mass Spectrometric Determination of the Heat of Sublimation of Boron and of the Dissociation Energy of B_2 . Jour. Chem. Phys. (Letters to the Editor), vol. 37, no. 6, Sept. 15, 1962, pp. 1367-1368.
102. Steiner, Bruce, Seman, Michael L., and Branscomb, Lewis M.: Electron Affinity of Atomic Iodine. Jour. Chem. Phys., vol. 37, no. 6, Sept. 15, 1962, pp. 1200-1202.
103. Schoonmaker, Richard C., and Porter, Richard F.: Gaseous Species in the Vaporization of Sodium Hydroxide. Jour. Chem. Phys., vol. 28, no. 3, Mar. 1958, pp. 454-457.
104. Law, Robert W., and Margrave, John L.: Mass Spectrometer Appearance Potentials for Positive Ion Fragments From BF_3 , $\text{B}(\text{CH}_3)_3$, $\text{B}(\text{C}_2\text{H}_5)_3$, $\text{B}(\text{OCH}_3)_3$, and $\text{HB}(\text{OCH}_3)_2$. Jour. Chem. Phys. (Letters to the Editor), vol. 25, no. 5, Nov. 1956, pp. 1086-1087.
105. Inghram, Mark G., Porter, Richard F., and Chupka, William A.: Mass Spectrometric Study of Gaseous Species in the $\text{B-B}_2\text{O}_3$ System. Jour. Chem. Phys., vol. 25, no. 3, Sept. 1956, pp. 498-501.
106. Chupka, William A., Inghram, Mark G., and Porter, Richard F.: Dissociation Energy of Gaseous LaO . Jour. Chem. Phys., vol. 24, no. 4, Apr. 1956, pp. 792-796.

107. Chupka, W. A., Berkowitz, J., and Inghram, Mark G.: Thermodynamics of the Zr-ZrO₂ System: The Dissociation Energies of ZrO and ZrO₂. Jour. Chem. Phys., vol. 26, no. 5, May 1957, pp. 1207-1210.
108. Reese, Robert M., and Dibeler, Vernon H.: Ionization and Dissociation of Nitrogen Trifluoride by Electron Impact. Jour. Chem. Phys., vol. 24, no. 6, June 1956, pp. 1175-1177.
109. Inghram, Mark G., Chupka, William A., and Porter, Richard F.: Mass Spectrometric Study of Barium Oxide Vapor. Jour. Chem. Phys., vol. 23, no. 11, Nov. 1955, pp. 2159-2165.
110. Duncan, A. B. F.: Calculation of Some Electronic Energy Levels of Sulfur Hexafluoride. Jour. Chem. Phys., vol. 20, no. 6, June 1952, pp. 951-960.
111. Eltenton, G. C.: The Study of Reaction Intermediates by Means of a Mass Spectrometer - Part I. Apparatus and Method. Jour. Chem. Phys., vol. 15, no. 7, July 1947, pp. 455-465.
112. Herzberg, G.: The Spectra and Structures of Free Methyl and Free Methylene. Proc. Roy. Soc. (London), ser. A, vol. 262, no. 1310, July 18, 1961, pp. 291-317.
113. Blanchard, L. P., and Le Goff, P.: Mass Spectrometric Study of the Species CS, SO, and CCl₂ Produced in Primary Heterogeneous Reactions. Canadian Jour. Chem., vol. 35, no. 1, Jan. 1957, pp. 89-98.

TABLE I.- BOND DISSOCIATION ENERGY VALUES

(a) Inorganic molecules

Name	Reaction	Energy, ev (a)	Reference
Aluminum monobromide	$\text{AlBr} \rightleftharpoons \text{Al} + \text{Br}$	4.3 ± 0.2 4.55	4 69
Aluminum monocarbide	$\text{AlC} \rightleftharpoons \text{Al} + \text{C}$	^b 1.65	13
Aluminum monochloride	$\text{AlCl} \rightleftharpoons \text{Al} + \text{Cl}$	5.1 ± 0.2 5.08	4 69
Aluminum trichloride	$\text{AlCl}_3 \rightleftharpoons \text{AlCl}_2 + \text{Cl}$	^b 3.93	13
Aluminum monofluoride	$\text{AlF} \rightleftharpoons \text{Al} + \text{F}$	6.85 6.7 ± 0.3 6.77	5 4 69
Aluminum monohydride	$\text{AlH} \rightleftharpoons \text{Al} + \text{H}$	2.9 ± 0.2 3.06	4 1
Aluminum monoiodide	$\text{AlI} \rightleftharpoons \text{Al} + \text{I}$	3.92 ± 0.1 3.77	4 69
Aluminum mononitride	$\text{AlN} \rightleftharpoons \text{Al} + \text{N}$	^b 3.7 ± 0.9	13
Aluminum monoxide	$\text{AlO} \rightleftharpoons \text{Al} + \text{O}$	4.99 ± 0.20 6.0	30 5
Aluminum monoxide, dimer	$\text{Al}_2\text{O}_2 \rightleftharpoons \text{AlO} + \text{AlO}$	5.85 ± 0.20	30
Aluminum suboxide	$\text{Al}_2\text{O} \rightleftharpoons \text{AlO} + \text{Al}$	5.68 ± 0.20	30
Aluminum oxyhydride	$\text{AlOH} \rightleftharpoons \text{Al} + \text{OH}$	^b (3.85)	13
	$\text{AlOH} \rightleftharpoons \text{AlO} + \text{H}$	^b (3.27)	13
Amidogen	$\text{NH}_2 \rightleftharpoons \text{NH} + \text{H}$	^b 3.9 ± 0.2	13
Ammonia	$\text{NH}_3 \rightleftharpoons \text{NH}_2 + \text{H}$	4.42	5

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Antimony, diatomic	$\text{Sb}_2 \rightleftharpoons \text{Sb} + \text{Sb}$	3.0 ± 0.5	4
Antimony monochloride	$\text{SbCl} \rightleftharpoons \text{Sb} + \text{Cl}$	3.7 ± 0.5	4
Antimony monofluoride	$\text{SbF} \rightleftharpoons \text{Sb} + \text{F}$	(4.0)	5
Antimony monoxide	$\text{SbO} \rightleftharpoons \text{Sb} + \text{O}$	3.2 ± 0.4	4
Arsenic, diatomic	$\text{As}_2 \rightleftharpoons \text{As} + \text{As}$	3.94	4
Arsenic monoxide	$\text{AsO} \rightleftharpoons \text{As} + \text{O}$	4.94 ± 0.13	67
Barium monochloride	$\text{BaCl} \rightleftharpoons \text{Ba} + \text{Cl}$	2.2 ± 0.5	4
Barium monofluoride	$\text{BaF} \rightleftharpoons \text{Ba} + \text{F}$	(3.0)	5
Barium monohydride	$\text{BaH} \rightleftharpoons \text{Ba} + \text{H}$	1.8 ± 0.1	4
Barium mononitride	$\text{BaN} \rightleftharpoons \text{Ba} + \text{N}$	2.5 to 3.9	98
Barium oxide	$\text{BaO} \rightleftharpoons \text{Ba} + \text{O}$	5.4	27
		4.7	1
		5.4 ± 0.5	4
		5.64 ± 0.20	109
Barium sulfide	$\text{BaS} \rightleftharpoons \text{Ba} + \text{S}$	2.3 ± 0.4	4
Beryllium monochloride	$\text{BeCl} \rightleftharpoons \text{Be} + \text{Cl}$	5.9 ± 0.5	13
Beryllium monofluoride	$\text{BeF} \rightleftharpoons \text{Be} + \text{F}$	8 ± 0.5	13
Beryllium monohydride	$\text{BeH} \rightleftharpoons \text{Be} + \text{H}$	2.3 ± 0.3	4
Beryllium oxide	$\text{BeO} \rightleftharpoons \text{Be} + \text{O}$	4.6 ± 0.1	66
		5.4 ± 0.7	4
Bismuth, diatomic	$\text{Bi}_2 \rightleftharpoons \text{Bi} + \text{Bi}$	1.70	1

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Bismuth monobromide	$\text{BiBr} \rightleftharpoons \text{Bi} + \text{Br}$	2.74 ± 0.01	4
Bismuth monochloride	$\text{BiCl} \rightleftharpoons \text{Bi} + \text{Cl}$	2.9 ± 0.2	4
Bismuth monofluoride	$\text{BiF} \rightleftharpoons \text{Bi} + \text{F}$	3.2 ± 0.4	4
Bismuth monohydride	$\text{BiH} \rightleftharpoons \text{Bi} + \text{H}$	2.5 ± 0.3	4
Bismuth oxide	$\text{BiO} \rightleftharpoons \text{Bi} + \text{O}$	(3.7) 3.39	5 27
Boron, diatomic	$\text{B}_2 \rightleftharpoons \text{B} + \text{B}$	3.6 3.0 ± 0.5 2.85 ± 0.24	79 4 101
Boron monobromide	$\text{BBr} \rightleftharpoons \text{B} + \text{Br}$	4.49 4.2 ± 0.2	69 4
Boron monochloride	$\text{BCl} \rightleftharpoons \text{B} + \text{Cl}$	5.1 ± 0.4 5.5	4 69
Boron monofluoride	$\text{BF} \rightleftharpoons \text{B} + \text{F}$	4.45 8.5 ± 0.5 8.0	79 4 69
Boron trifluoride	$\text{BF}_3 \rightleftharpoons \text{BF}_2 + \text{F}$	6.65 ± 0.30	13
Boron monohydride	$\text{BH} \rightleftharpoons \text{B} + \text{H}$	3.54 3.0 ± 0.4	79 4
Boron trihydride	$\text{BH}_3 \rightleftharpoons \text{BH} + \text{H}_2$	4.1 ± 0.4	13
Boron nitride	$\text{BN} \rightleftharpoons \text{B} + \text{N}$	4.96 4.0 ± 0.5	79 4

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Boron monoxide	$\text{BO} \rightleftharpoons \text{B} + \text{O}$	7.27 7.6 $\pm$ 0.4 5.46 $\pm$ 0.20 (8.0)	79 4 67 5
Boron sulfide	$\text{BS} \rightleftharpoons \text{B} + \text{S}$	5.1 $\pm$ 0.8	4
Bromine	$\text{Br}_2 \rightleftharpoons \text{Br} + \text{Br}$	1.971	1
Bromine chloride	$\text{BrCl} \rightleftharpoons \text{Br} + \text{Cl}$	2.26	1
Bromine fluoride	$\text{BrF} \rightleftharpoons \text{Br} + \text{F}$	2.16 $\pm$ 0.02	4
Bromine monoxide	$\text{BrO} \rightleftharpoons \text{Br} + \text{O}$	1.8 $\pm$ 0.5	4
Cadmium monohydride	$\text{CdH} \rightleftharpoons \text{Cd} + \text{H}$	0.678 $\pm$ 0.005	4
Cadmium oxide	$\text{CdO} \rightleftharpoons \text{Cd} + \text{O}$	<3.8	4
Cadmium sulfide	$\text{CdS} \rightleftharpoons \text{Cd} + \text{S}$	3.9 $\pm$ 0.2	4
Calcium monochloride	$\text{CaCl} \rightleftharpoons \text{Ca} + \text{Cl}$	$\leq$ 2.76	4
Calcium monofluoride	$\text{CaF} \rightleftharpoons \text{Ca} + \text{F}$	$\leq$ 3.15	4
Calcium monohydride	$\text{CaH} \rightleftharpoons \text{Ca} + \text{H}$	$\leq$ 1.70	4
Calcium mononitride	$\text{CaN} \rightleftharpoons \text{Ca} + \text{N}$	2.2 to 4.0	98
Calcium oxide	$\text{CaO} \rightleftharpoons \text{Ca} + \text{O}$	3.93 5.9 4.4 $\pm$ 0.6 4.7 $\pm$ 0.5	27 1 5 4
Calcium sulfide	$\text{CaS} \rightleftharpoons \text{Ca} + \text{S}$	5.0 $\pm$ 0.5	4

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Carbon, diatomic	$C_2 \rightleftharpoons C + C$	4.9 ± 0.3	4
		6.25 ± 0.2	17
		6.5	5
		6.07	79
		6.11	45
Carbon monoxide	$CO \rightleftharpoons C + O$	11.11 ± 0.01	4
	$CO^+ \rightleftharpoons C^+ + O$	8.43 ± 0.02	4
Carbon dioxide	$CO_2 \rightleftharpoons CO + O$	5.45	79
		5.5	5
Carbon phosphide	$CP \rightleftharpoons C + P$	5.43	27
		(6.9)	1
		(6.0)	5
Carbon monosulfide	$CS \rightleftharpoons C + S$	7.90	27
		7.2 ± 1.0	4
Carbon disulfide	$CS_2 \rightleftharpoons CS + S$	^b 4.68	13
Carbonyl sulfide	$COS \rightleftharpoons CO + S$	3.09	79
Cerium oxide	$CeO \rightleftharpoons Ce + O$	(6.5)	5
Cesium, diatomic	$Cs_2 \rightleftharpoons Cs + Cs$	0.45	1
Cesium bromide	$CsBr \rightleftharpoons Cs + Br$	4.31 ± 0.12	48
	$CsBr \rightleftharpoons Cs^+ + Br^-$	3.95	5
		4.59	53
Cesium chloride	$CsCl \rightleftharpoons Cs + Cl$	4.65 ± 0.12	48
	$CsCl \rightleftharpoons Cs^+ + Cl^-$	4.38	5
		4.77	53

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Cesium fluoride	$\text{CsF} \rightleftharpoons \text{Cs} + \text{F}$	5.33 ± 0.33	48
		5.5 ± 0.2	4
		5.25	5
	$\text{CsF} \rightleftharpoons \text{Cs}^+ + \text{F}^-$	5.55	53
Cesium hydride	$\text{CsH} \rightleftharpoons \text{Cs} + \text{H}$	1.8 ± 0.3	4
Cesium hydroxide	$\text{CsOH} \rightleftharpoons \text{Cs} + \text{OH}$	3.95	81
Cesium iodide	$\text{CsI} \rightleftharpoons \text{Cs} + \text{I}$	3.37	1
		3.63 ± 0.16	48
		3.25	5
	$\text{CsI} \rightleftharpoons \text{Cs}^+ + \text{I}^-$	4.29	53
Cesium nitride	$\text{CsN} \rightleftharpoons \text{Cs} + \text{N}$	3.1 to 4.2	98
Cesium monoxide	$\text{CsO} \rightleftharpoons \text{Cs} + \text{O}$	3.47	81
Chlorine	$\text{Cl}_2 \rightleftharpoons \text{Cl} + \text{Cl}$	2.475	1
	$\text{Cl}_2^+ \rightleftharpoons \text{Cl} + \text{Cl}^+$	4.2 ± 0.3	4
Chlorine fluoride	$\text{FCl} \rightleftharpoons \text{F} + \text{Cl}$	2.616	1
Chlorine monoxide	$\text{ClO} \rightleftharpoons \text{Cl} + \text{O}$	1.9	79
		2.73 ± 0.03	4
Chlorine dioxide	$\text{ClO}_2 \rightleftharpoons \text{Cl} + 2\text{O}$	5.26 ± 0.09	68
	$\text{ClO}_2 \rightleftharpoons \text{ClO} + \text{O}$	2.5	5
Chlorine trioxide	$\text{ClO}_3 \rightleftharpoons \text{Cl} + 3\text{O}$	6.81 ± 0.10	67
Chlorine oxide	$\text{Cl}_2\text{O} \rightleftharpoons 2\text{Cl} + \text{O}$	4.08 ± 0.10	67
Chromium monoxide	$\text{CrO} \rightleftharpoons \text{Cr} + \text{O}$	4.2 ± 0.5	4
Copper, diatomic	$\text{Cu}_2 \rightleftharpoons \text{Cu} + \text{Cu}$	2.04	5

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Copper monobromide	$\text{CuBr} \rightleftharpoons \text{Cu} + \text{Br}$	3.4 ± 0.25	4
Copper monochloride	$\text{CuCl} \rightleftharpoons \text{Cu} + \text{Cl}$	3.7 ± 0.25	4
Copper monofluoride	$\text{CuF} \rightleftharpoons \text{Cu} + \text{F}$	3.0	5
Copper monohydride	$\text{CuH} \rightleftharpoons \text{Cu} + \text{H}$	2.86	5
Copper hydroxide	$\text{CuOH} \rightleftharpoons \text{Cu} + \text{OH}$	2.65	5
Copper oxide	$\text{CuO} \rightleftharpoons \text{Cu} + \text{O}$	4.9 ± 0.5	4
Cyano	$\text{CN} \rightleftharpoons \text{C} + \text{N}$	7.55 ± 0.11	16
		8.48	27
		8.2 ± 0.2	25
		7.6	79
		8.1 ± 0.3	4
		7.5 ± 0.1	86
Cyanoacetylene	$\text{HC}_3\text{N} \rightleftharpoons \text{C}_2\text{H} + \text{CN}$	5.2	37
	$\text{HC}_3\text{N} \rightleftharpoons \text{C}_3\text{H} + \text{N}$	6.8	37
Cyanogen	$\text{C}_2\text{N}_2 \rightleftharpoons \text{C}_2\text{N} + \text{N}$	7.0	37
		6.29 ± 0.25	16
	$\text{C}_2\text{N}_2 \rightleftharpoons \text{CN} + \text{CN}$	6.13	79
		4.51	37
		4.86	5
		4.64 ± 0.2	39
		5.51 ± 0.10	54
		5.20 ± 0.35	55
		5.05 ± 0.45	4
		5.42 ± 0.35	75
-----	$\text{C}_2\text{N} \rightleftharpoons \text{CN} + \text{C}$	6.76	37
Cyanogen bromide	$\text{CNBr} \rightleftharpoons \text{CN} + \text{Br}$	(3.6)	96

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Cyanogen chloride	$\text{CNCI} \rightleftharpoons \text{CN} + \text{Cl}$	3.6 ± 0.2 b4.0	39 14
Cyanogen fluoride	$\text{CNF} \rightleftharpoons \text{F} + \text{CN}$	b5.75	14
Cyanogen iodide	$\text{CNI} \rightleftharpoons \text{CN} + \text{I}$	(3.0)	96
Deuterium	$\text{D}_2 \rightleftharpoons \text{D} + \text{D}$	4.5557	4
Diborane	$\text{B}_2\text{H}_6 \rightleftharpoons \text{BH}_3 + \text{BH}_3$	1.23 ± 0.09	44
Diboron dioxide	$\text{B}_2\text{O}_2 \rightleftharpoons \text{BO} + \text{BO}$	≥ 4.3	105
Dicyanoacetylene	$\text{C}_4\text{N}_2 \rightleftharpoons \text{C}_2\text{N} + \text{C}_2\text{N}$	5.1	37
	$\text{C}_4\text{N}_2 \rightleftharpoons \text{C}_3\text{N} + \text{CN}$	4.0	37
Dicyanodiacetylene	$\text{C}_6\text{N}_2 \rightleftharpoons \text{C}_3\text{N} + \text{C}_3\text{N}$	3.42	37
	$\text{C}_6\text{N}_2 \rightleftharpoons \text{C}_4\text{N} + \text{C}_2\text{N}$	4.3	37
Difluoroamino	$\text{NF}_2 \rightleftharpoons \text{NF} + \text{F}$	(3.08)	15
Difluorodiazene (trans)	trans $\text{N}_2\text{F}_2 \rightleftharpoons 2\text{NF}$	4.5 ± 0.4	84
Fluorine	$\text{F}_2 \rightleftharpoons \text{F} + \text{F}$	1.609 ± 0.037	35
	$\text{F}_2^+ \rightleftharpoons \text{F} + \text{F}^+$	3.18	23
Gallium monochloride	$\text{GaCl} \rightleftharpoons \text{Ga} + \text{Cl}$	4.94 ± 0.17	48
Gallium monofluoride	$\text{GaF} \rightleftharpoons \text{Ga} + \text{F}$	6.24	69
Gallium monoxide	$\text{GaO} \rightleftharpoons \text{Ga} + \text{O}$	2.52 ± 0.50	67
Germanium, diatomic	$\text{Ge}_2 \rightleftharpoons \text{Ge} + \text{Ge}$	2.8	5

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Germanium monoxide	$\text{GeO} \rightleftharpoons \text{Ge} + \text{O}$	6.8	5
Germanium monosulfide	$\text{GeS} \rightleftharpoons \text{Ge} + \text{S}$	5.66 ± 0.13	4
Hydrazine	$\text{N}_2\text{H}_4 \rightleftharpoons \text{NH}_2 + \text{NH}_2$	2.6 ± 0.2	5
	$\text{N}_2\text{H}_4 \rightleftharpoons \text{N}_2\text{H}_3 + \text{H}$	3.30 ± 0.20	42
Hydrogen	$\text{H}_2 \rightleftharpoons \text{H} + \text{H}$	4.476	1
	$\text{H}_2^+ \rightleftharpoons \text{H} + \text{H}^+$	2.648	1
Hydrogen bromide	$\text{HBr} \rightleftharpoons \text{H} + \text{Br}$	3.754	1
Hydrogen chloride	$\text{HCl} \rightleftharpoons \text{H} + \text{Cl}$	4.431	4
Hydrogen cyanide	$\text{HCN} \rightleftharpoons \text{H} + \text{CN}$	5.59 ± 0.11	16
		4.94	5
		4.81 ± 0.1	39
Hydrogen deuteride	$\text{HD} \rightleftharpoons \text{H} + \text{D}$	4.5133	4
Hydrogen fluoride	$\text{HF} \rightleftharpoons \text{H} + \text{F}$	5.86	13
		5.79	79
		5.81 ± 0.10	5
Hydrogen iodide	$\text{HI} \rightleftharpoons \text{H} + \text{I}$	3.056	1
Hydrogen oxybromide	$\text{HOBr} \rightleftharpoons \text{HO} + \text{Br}$	2.43	5
Hydrogen oxychloride	$\text{HOCl} \rightleftharpoons \text{OH} + \text{Cl}$	2.60	5
Hydrogen peroxide	$\text{H}_2\text{O}_2 \rightleftharpoons \text{OH} + \text{OH}$	2.07 ± 0.10	31
		2.10 ± 0.11	46
	$\text{H}_2\text{O}_2 \rightleftharpoons \text{HO}_2 + \text{H}$	3.83 ± 0.09	90
Hydrogen persulfide	$\text{H}_2\text{S}_2 \rightleftharpoons \text{SH} + \text{SH}$	2.95	5
		2.6 ± 0.1	100

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Hydrogen monosulfide	$\text{SH} \rightleftharpoons \text{S} + \text{H}$	3.59 3.65 3.85 ± 0.2	27 79 4
Hydrogen sulfide	$\text{H}_2\text{S} \rightleftharpoons \text{H} + \text{SH}$	3.92 (3.9)	27 5
Hydroperoxy	$\text{HO}_2 \rightleftharpoons \text{H} + \text{O}_2$	2.04 ± 0.1 1.99 ± 0.09	40 90
Hydroxyl	$\text{OH} \rightleftharpoons \text{O} + \text{H}$	4.393 4.35 4.45 ± 0.2 4.40	27 1 4 5
	$\text{OH}^+ \rightleftharpoons \text{O} + \text{H}^+$	≥ 4.4	1
Hypoiodous acid	$\text{HOI} \rightleftharpoons \text{HO} + \text{I}$	2.4 ± 0.1	5
Imidogen	$\text{NH} \rightleftharpoons \text{N} + \text{H}$	3.78 3.7 ± 0.5	79 4
Indium monochloride	$\text{InCl} \rightleftharpoons \text{In} + \text{Cl}$	4.44	69
Indium monofluoride	$\text{InF} \rightleftharpoons \text{In} + \text{F}$	5.46	69
Indium monohydride	$\text{InH} \rightleftharpoons \text{In} + \text{H}$	2.5 ± 0.1	4
Indium oxide	$\text{InO} \rightleftharpoons \text{In} + \text{O}$	1.1 ± 0.2	4
Iodine	$\text{I}_2 \rightleftharpoons \text{I} + \text{I}$	1.5417	1
Iodine bromide	$\text{IBr} \rightleftharpoons \text{I} + \text{Br}$	1.817	1
Iodine chloride	$\text{ICl} \rightleftharpoons \text{I} + \text{Cl}$	2.152	1
Iodine fluoride	$\text{IF} \rightleftharpoons \text{I} + \text{F}$	1.98 ± 0.05	4
Iodine monoxide	$\text{IO} \rightleftharpoons \text{I} + \text{O}$	1.9 ± 0.2	4

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Iron monoxide	$\text{FeO} \rightleftharpoons \text{Fe} + \text{O}$	(4.0)	5
Lanthanum monoxide	$\text{LaO} \rightleftharpoons \text{La} + \text{O}$	8.15 ± 0.35	106
Lead, diatomic	$\text{Pb}_2 \rightleftharpoons \text{Pb} + \text{Pb}$	1.0	5
Lead monochloride	$\text{PbCl} \rightleftharpoons \text{Pb} + \text{Cl}$	3.1 ± 0.3	4
Lead monohydride	$\text{PbH} \rightleftharpoons \text{Pb} + \text{H}$	1.8 ± 0.2	4
Lead monoxide	$\text{PbO} \rightleftharpoons \text{Pb} + \text{O}$	4.1 ± 0.3	4
Lithium, diatomic	$\text{Li}_2 \rightleftharpoons \text{Li} + \text{Li}$	1.03 1.10 ± 0.05	1 4
Lithium bromide	$\text{LiBr} \rightleftharpoons \text{Li} + \text{Br}$	4.53 4.36 ± 0.12 4.35 ± 0.3	1 48 4
	$\text{LiBr} \rightleftharpoons \text{Li}^+ + \text{Br}^-$	6.24	53
Lithium chloride	$\text{LiCl} \rightleftharpoons \text{Li} + \text{Cl}$	5.1 4.79 ± 0.12 5.0 ± 0.3	1 48 4
	$\text{LiCl} \rightleftharpoons \text{Li}^+ + \text{Cl}^-$	6.50	53
Lithium fluoride	$\text{LiF} \rightleftharpoons \text{Li} + \text{F}$	5.90 ± 0.33 5.95 ± 0.5	48 4
	$\text{LiF} \rightleftharpoons \text{Li}^+ + \text{F}^-$	7.83	53
Lithium hydride	$\text{LiH} \rightleftharpoons \text{Li} + \text{H}$	2.429 2.5 ± 0.2	27 4
Lithium hydroxide	$\text{LiOH} \rightleftharpoons \text{Li} + \text{OH}$	4.42	81
Lithium iodide	$\text{LiI} \rightleftharpoons \text{Li} + \text{I}$	3.58 3.57 ± 0.12 3.5 ± 0.2	1 48 4

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Lithium iodide	$\text{LiI} \rightleftharpoons \text{Li}^+ + \text{I}^-$	5.85	53
Lithium mononitride	$\text{LiN} \rightleftharpoons \text{Li} + \text{N}$	b(4.86)	13
Lithium monoxide	$\text{LiO} \rightleftharpoons \text{Li} + \text{O}$	<3.6	81
Lithium oxide	$\text{Li}_2\text{O} \rightleftharpoons 2\text{Li} + \text{O}$	b(7.3)	13
Magnesium monochloride	$\text{MgCl} \rightleftharpoons \text{Mg} + \text{Cl}$	2.7 ± 0.7	4
Magnesium monofluoride	$\text{MgF} \rightleftharpoons \text{Mg} + \text{F}$	3.2 ± 0.7	4
Magnesium monohydride	$\text{MgH} \rightleftharpoons \text{Mg} + \text{H}$	2.0 ± 0.5 ≤ 2.49	4 1
Magnesium mononitride	$\text{MgN} \rightleftharpoons \text{Mg} + \text{N}$	2.0 to 4.4	98
Magnesium oxide	$\text{MgO} \rightleftharpoons \text{Mg} + \text{O}$	4.48 (4.0) 4.5 ± 0.7	27 5 4
Manganese monoxide	$\text{MnO} \rightleftharpoons \text{Mn} + \text{O}$	4.0 ± 0.4	67
Mercury, diatomic	$\text{Hg}_2 \rightleftharpoons \text{Hg} + \text{Hg}$	0.06	4
Mercury monochloride	$\text{HgCl} \rightleftharpoons \text{Hg} + \text{Cl}$	1.0 ± 0.1	4
Mercury monofluoride	$\text{HgF} \rightleftharpoons \text{Hg} + \text{F}$	1.4 ± 0.5	4
Mercury monohydride	$\text{HgH} \rightleftharpoons \text{Hg} + \text{H}$	0.372	4
Mercury sulfide	$\text{HgS} \rightleftharpoons \text{Hg} + \text{S}$	2.8 ± 0.2	4
Molybdenum oxide	$\text{MoO} \rightleftharpoons \text{Mo} + \text{O}$	5.0 ± 0.7	58
Nickel monochloride	$\text{NiCl} \rightleftharpoons \text{Ni} + \text{Cl}$	3.82 ± 0.20	48

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Nickel monohydride	$\text{NiH} \rightleftharpoons \text{Ni} + \text{H}$	2.6 ± 0.3	4
Nickel oxide	$\text{NiO} \rightleftharpoons \text{Ni} + \text{O}$	<4.4	67
Niobium oxide	$\text{NbO} \rightleftharpoons \text{Nb} + \text{O}$	(4.0)	5
Nitric oxide	$\text{NO} \rightleftharpoons \text{N} + \text{O}$	6.49 ± 0.05	4
	$\text{NO}^+ \rightleftharpoons \text{N} + \text{O}^+$	10.6	1
Nitrogen	$\text{N}_2 \rightleftharpoons \text{N} + \text{N}$	9.762	4
	$\text{N}_2^+ \rightleftharpoons \text{N} + \text{N}^+$	8.73	4
Nitrogen monofluoride	$\text{NF} \rightleftharpoons \text{N} + \text{F}$	(3.08)	15
Nitrogen trifluoride	$\text{NF}_3 \rightleftharpoons \text{NF}_2 + \text{F}$	2.47 ± 0.08	15
Nitrogen dioxide	$\text{NO}_2 \rightleftharpoons \text{NO} + \text{O}$	3.13	5
Nitrogen trioxide	$\text{N}_2\text{O}_3 \rightleftharpoons \text{NO}_2 + \text{NO}$	0.43	5
Nitrogen tetraoxide	$\text{N}_2\text{O}_4 \rightleftharpoons \text{NO}_2 + \text{NO}_2$	0.56	5
Nitrosyl chloride	$\text{NOCl} \rightleftharpoons \text{NO} + \text{Cl}$	1.60	5
Nitrous oxide	$\text{N}_2\text{O} \rightleftharpoons \text{N} + \text{NO}$	≤ 4.50	20
	$\text{N}_2\text{O} \rightleftharpoons \text{N}_2 + \text{O}$	≤ 1.34	20
		1.2 ± 0.2	26
Oxygen	$\text{O}_2 \rightleftharpoons \text{O} + \text{O}$	5.115	5
	$\text{O}_2^+ \rightleftharpoons \text{O} + \text{O}^+$	6.48 ± 0.1	4
Oxygen fluoride	$\text{OF} \rightleftharpoons \text{O} + \text{F}$	1.1	43
Oxygen difluoride	$\text{OF}_2 \rightleftharpoons \text{FO} + \text{F}$	2.8	43

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Ozone	$O_3 \rightleftharpoons O_2 + O$	1.06	34
Perchloryl fluoride	$O_3ClF \rightleftharpoons ClO_3 + F$	2.6	52
	$O_3ClF \rightleftharpoons ClO_2 + O + F$	4.6	52
	$O_3ClF \rightleftharpoons ClO + 2O + F$	7.6	52
Phosphorus, diatomic	$P_2 \rightleftharpoons P + P$	5.031	79
Phosphorus monohydride	$PH \rightleftharpoons P + H$	3.32	27
		3.3	79
Phosphorus mononitride	$PN \rightleftharpoons P + N$	7.09	27
		6.0 ± 0.8	4
Phosphorus monoxide	$PO \rightleftharpoons P + O$	5.4	27
		6.2 ± 0.5	4
Phosphorus oxychloride	$OPCl_3 \rightleftharpoons PCl_3 + O$	5.28 ± 0.10	5
Potassium, diatomic	$K_2 \rightleftharpoons K + K$	0.514	1
Potassium bromide	$KBr \rightleftharpoons K + Br$	3.96	1
		3.93 ± 0.10	48
		3.94 ± 0.05	4
	$KBr \rightleftharpoons K^+ + Br^-$	4.77	53
Potassium chloride	$KCl \rightleftharpoons K + Cl$	4.40 ± 0.05	4
		4.32 ± 0.10	48
		4.38	5
	$KCl \rightleftharpoons K^+ + Cl^-$	4.99	53
Potassium fluoride	$KF \rightleftharpoons K + F$	5.07 ± 0.33	48
		5.0 ± 0.25	4
		5.12	5
	$KF \rightleftharpoons K^+ + F^-$	5.90	53

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Potassium hydride	$\text{KH} \rightleftharpoons \text{K} + \text{H}$	1.86 ± 0.15	4
Potassium hydroxide	$\text{KOH} \rightleftharpoons \text{K} + \text{OH}$	3.73	81
Potassium iodide	$\text{KI} \rightleftharpoons \text{K} + \text{I}$	3.32 ± 0.05	4
		3.48 ± 0.12	48
		3.34	5
	$\text{KI} \rightleftharpoons \text{K}^+ + \text{I}^-$	4.50	53
Potassium nitride	$\text{KN} \rightleftharpoons \text{K} + \text{N}$	3.4 to 4.8	98
Potassium monoxide	$\text{KO} \rightleftharpoons \text{K} + \text{O}$	3.51	81
Rubidium, diatomic	$\text{Rb}_2 \rightleftharpoons \text{Rb} + \text{Rb}$	0.49	1
Rubidium bromide	$\text{RbBr} \rightleftharpoons \text{Rb} + \text{Br}$	3.93	1
		3.97 ± 0.10	48
		3.90	5
	$\text{RbBr} \rightleftharpoons \text{Rb}^+ + \text{Br}^-$	4.58	53
Rubidium chloride	$\text{RbCl} \rightleftharpoons \text{Rb} + \text{Cl}$	4.42	5
		4.40 ± 0.10	48
		4.5 ± 0.2	4
	$\text{RbCl} \rightleftharpoons \text{Rb}^+ + \text{Cl}^-$	4.77	53
Rubidium fluoride	$\text{RbF} \rightleftharpoons \text{Rb} + \text{F}$	5.20 ± 0.33	48
		5.35 ± 0.2	4
		5.16	5
	$\text{RbF} \rightleftharpoons \text{Rb}^+ + \text{F}^-$	5.68	53
Rubidium hydride	$\text{RbH} \rightleftharpoons \text{Rb} + \text{H}$	1.7 ± 0.2	4
Rubidium iodide	$\text{RbI} \rightleftharpoons \text{Rb} + \text{I}$	3.29	1
		3.52 ± 0.10	48
		3.35 ± 0.1	4
	$\text{RbI} \rightleftharpoons \text{Rb}^+ + \text{I}^-$	4.31	53
Rubidium nitride	$\text{RbN} \rightleftharpoons \text{Rb} + \text{N}$	3.0 to 4.2	98

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Rubidium monoxide	$\text{RbO} \rightleftharpoons \text{Rb} + \text{O}$	3.42	81
Scandium oxide	$\text{ScO} \rightleftharpoons \text{Sc} + \text{O}$	(6.0)	5
Selenium, diatomic	$\text{Se}_2 \rightleftharpoons \text{Se} + \text{Se}$	2.8 ± 0.1	4
Selenium monoxide	$\text{SeO} \rightleftharpoons \text{Se} + \text{O}$	3.5 ± 1	4
Selenium dioxide	$\text{SeO}_2 \rightleftharpoons \text{Se} + 2\text{O}$	8.72 ± 0.20	67
Silicon, diatomic	$\text{Si}_2 \rightleftharpoons \text{Si} + \text{Si}$	3.3	5
Silicon monochloride	$\text{SiCl} \rightleftharpoons \text{Si} + \text{Cl}$	3.3 ± 0.5	4
Silicon monofluoride	$\text{SiF} \rightleftharpoons \text{Si} + \text{F}$	3.8 ± 0.4 5.42	4 61
Silicon monohydride	$\text{SiH} \rightleftharpoons \text{Si} + \text{H}$	3.2	5
Silicon mononitride	$\text{SiN} \rightleftharpoons \text{Si} + \text{N}$	4.5 ± 0.4	4
Silicon monoxide	$\text{SiO} \rightleftharpoons \text{Si} + \text{O}$	8.09 7.2 ± 0.4 7.33 ± 0.15 8.0 ± 0.3	27 4 67 5
Silicon dioxide	$\text{SiO}_2 \rightleftharpoons \text{Si} + 2\text{O}$	12.96 ± 0.43	68
Silicon monosulfide	$\text{SiS} \rightleftharpoons \text{Si} + \text{S}$	6.4 ± 0.4	4
Silver, diatomic	$\text{Ag}_2 \rightleftharpoons \text{Ag} + \text{Ag}$	1.7	5
Silver monochloride	$\text{AgCl} \rightleftharpoons \text{Ag} + \text{Cl}$	3.3 ± 0.2	4
Silver monohydride	$\text{AgH} \rightleftharpoons \text{Ag} + \text{H}$	2.3 ± 0.1	4
Silver monoxide	$\text{AgO} \rightleftharpoons \text{Ag} + \text{O}$	1.39 ± 0.40	67

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Sodium, diatomic	$\text{Na}_2 \rightleftharpoons \text{Na} + \text{Na}$	0.73	1
Sodium bromide	$\text{NaBr} \rightleftharpoons \text{Na} + \text{Br}$	3.85	1
		3.84 ± 0.10	48
		3.80 ± 0.1	4
	$\text{NaBr} \rightleftharpoons \text{Na}^+ + \text{Br}^-$	5.38	53
Sodium chloride	$\text{NaCl} \rightleftharpoons \text{Na} + \text{Cl}$	4.23 ± 0.10	48
		4.24 ± 0.05	4
	$\text{NaCl} \rightleftharpoons \text{Na}^+ + \text{Cl}^-$	5.64	53
Sodium fluoride	$\text{NaF} \rightleftharpoons \text{Na} + \text{F}$	5.25 ± 0.30	48
		4.65 ± 0.25	4
		4.64	5
	$\text{NaF} \rightleftharpoons \text{Na}^+ + \text{F}^-$	6.55	53
Sodium hydride	$\text{NaH} \rightleftharpoons \text{Na} + \text{H}$	2.05 ± 0.2	4
Sodium hydroxide	$\text{NaOH} \rightleftharpoons \text{Na} + \text{OH}$	3.51	81
Sodium iodide	$\text{NaI} \rightleftharpoons \text{Na} + \text{I}$	3.16	1
		3.13 ± 0.10	48
		3.07 ± 0.1	4
	$\text{NaI} \rightleftharpoons \text{Na}^+ + \text{I}^-$	5.09	53
Sodium nitride	$\text{NaN} \rightleftharpoons \text{Na} + \text{N}$	3.6 to 5.4	98
Sodium monoxide	$\text{NaO} \rightleftharpoons \text{Na} + \text{O}$	3.08	81
Sodium potasside	$\text{NaK} \rightleftharpoons \text{Na} + \text{K}$	0.62 ± 0.03	4
Strontium monofluoride	$\text{SrF} \rightleftharpoons \text{Sr} + \text{F}$	(2.7)	5
Strontium monohydride	$\text{SrH} \rightleftharpoons \text{Sr} + \text{H}$	1.65 ± 0.1	4
Strontium mononitride	$\text{SrN} \rightleftharpoons \text{Sr} + \text{N}$	2.3 to 3.8	98

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Strontium oxide	$\text{SrO} \rightleftharpoons \text{Sr} + \text{O}$	4.8 4.6 ± 0.5 (3.6)	27 4 5
Sulfur, diatomic	$\text{S}_2 \rightleftharpoons \text{S} + \text{S}$	4.243 4.4 ± 0.1 3.6	27 4 5
Sulfur hexafluoride	$\text{SF}_6 \rightleftharpoons \text{SF}_5 + \text{F}$	≤ 3.39	19
Sulfur nitride	$\text{SN} \rightleftharpoons \text{S} + \text{N}$	5.0 ± 1	13
Sulfur monoxide	$\text{SO} \rightleftharpoons \text{S} + \text{O}$	5.357 5.146 5.184	82 79 4
Sulfur dioxide	$\text{SO}_2 \rightleftharpoons \text{SO} + \text{O}$ $\text{SO}_2 \rightleftharpoons \text{S} + 2\text{O}$	5.68 11.04 ± 0.04	82 68
Sulfur trioxide	$\text{SO}_3 \rightleftharpoons \text{SO}_2 + \frac{1}{2} \text{O}_2$	0.99	79
Tantalum oxide	$\text{TaO} \rightleftharpoons \text{Ta} + \text{O}$	8.4 ± 0.5	5
Tellurium, diatomic	$\text{Te}_2 \rightleftharpoons \text{Te} + \text{Te}$	2.3 ± 0.2	4
Tellurium monoxide	$\text{TeO} \rightleftharpoons \text{Te} + \text{O}$	2.725 ± 0.002	4
Tellurium dioxide	$\text{TeO}_2 \rightleftharpoons \text{Te} + 2\text{O}$	9.32 ± 0.33	67
Tetrafluorohydrazine	$\text{N}_2\text{F}_4 \rightleftharpoons \text{NF}_2 + \text{NF}_2$	0.9	15
Thallium monochloride	$\text{TlCl} \rightleftharpoons \text{Tl} + \text{Cl}$	3.88	69
Thallium monofluoride	$\text{TlF} \rightleftharpoons \text{Tl} + \text{F}$	4.75 ± 0.2	4

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Continued

Name	Reactions	Energy, ev (a)	Reference
Thallium monohydride	$\text{TlH} \rightleftharpoons \text{Tl} + \text{H}$	2.0 ± 0.2	4
Thallium monoiodide	$\text{TlI} \rightleftharpoons \text{Tl} + \text{I}$	2.95 ± 0.12	48
Thorium dioxide	$\text{ThO}_2 \rightleftharpoons \text{Th} + 2\text{O}$	15.96 ± 0.60	68
Tin, diatomic	$\text{Sn}_2 \rightleftharpoons \text{Sn} + \text{Sn}$	1.99	5
Tin monofluoride	$\text{SnF} \rightleftharpoons \text{Sn} + \text{F}$	3.3 ± 0.5	4
Tin monoxide	$\text{SnO} \rightleftharpoons \text{Sn} + \text{O}$	5.72 ± 0.10	67
Titanium monoxide	$\text{TiO} \rightleftharpoons \text{Ti} + \text{O}$	6.94 ± 0.10	67
Titanium dioxide	$\text{TiO}_2 \rightleftharpoons \text{Ti} + 2\text{O}$	13.57 ± 0.20	68
Tungsten monoxide	$\text{WO} \rightleftharpoons \text{W} + \text{O}$	6.68 ± 0.45	58
Tungsten dioxide	$\text{WO}_2 \rightleftharpoons \text{W} + 2\text{O}$	13.23 ± 0.43	68
Uranium monoxide	$\text{UO} \rightleftharpoons \text{U} + \text{O}$	7.76 ± 0.40	58
Uranium dioxide	$\text{UO}_2 \rightleftharpoons \text{U} + 2\text{O}$	15.3 ± 0.6	68
Vanadium monoxide	$\text{VO} \rightleftharpoons \text{V} + \text{O}$	6.4	5
Vanadium dioxide	$\text{VO}_2 \rightleftharpoons \text{V} + 2\text{O}$	12.84 ± 0.43	68
Water	$\text{H}_2\text{O} \rightleftharpoons \text{H}_2 + \text{O}$	5.01	79
	$\text{H}_2\text{O} \rightleftharpoons \text{H} + \text{OH}$	5.12	27
		5.10	46
Zinc monochloride	$\text{ZnCl} \rightleftharpoons \text{Zn} + \text{Cl}$	2.1 ± 0.2	4
Zinc monohydride	$\text{ZnH} \rightleftharpoons \text{Zn} + \text{H}$	0.845 ± 0.02	4

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(a) Inorganic molecules - Concluded

Name	Reactions	Energy, ev (a)	Reference
Zinc oxide	$\text{ZnO} \rightleftharpoons \text{Zn} + \text{O}$	≤ 4.0	5
Zinc sulfide	$\text{ZnS} \rightleftharpoons \text{Zn} + \text{S}$	4.25	5
Zirconium monoxide	$\text{ZrO} \rightleftharpoons \text{Zr} + \text{O}$	7.9 ± 0.2	13
Zirconium dioxide	$\text{ZrO}_2 \rightleftharpoons \text{Zr} + \text{O}_2$	$^b 9.84 \pm 0.20$	13

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(b) Organic molecules

Name	Reaction	Energy, ev (a)	Reference
Acetaldehyde	$\text{CH}_3\text{CHO} \rightleftharpoons \text{CH}_3\text{CO} + \text{H}$	3.34	70
	$\text{CH}_3\text{CHO} \rightleftharpoons \text{CH}_3 + \text{CHO}$	3.26 ± 0.09	96
Acetone	$(\text{CH}_3)_2\text{CO} \rightleftharpoons \text{CH}_3\text{CO} + \text{CH}_3$	2.99	70
Acetyl	$\text{CH}_3\text{CO} \rightleftharpoons \text{CH}_3 + \text{CO}$	(0.7)	5
Acetyl bromide	$\text{CH}_3\text{COBr} \rightleftharpoons \text{CH}_3\text{CO} + \text{Br}$	2.56	70
Acetyl chloride	$\text{CH}_3\text{COCl} \rightleftharpoons \text{CH}_3\text{CO} + \text{Cl}$	3.16	70
Acetylene	$\text{C}_2\text{H}_2 \rightleftharpoons \text{C}_2\text{H} + \text{H}$	(4.9)	45
	$\text{C}_2\text{H}_2 \rightleftharpoons \text{CH} + \text{CH}$	9.89	45
Benzene	$\text{C}_6\text{H}_6 \rightleftharpoons \text{C}_6\text{H}_5 + \text{H}$	4.42	5
Biacetyl	$\text{CH}_3\text{COCOCH}_3 \rightleftharpoons 2\text{CH}_3\text{CO}$	2.6	96
n-Butane	$\text{n-C}_4\text{H}_{10} \rightleftharpoons \text{n-C}_3\text{H}_7 + \text{CH}_3$	3.75	49
	$\text{n-C}_4\text{H}_{10} \rightleftharpoons \text{n-C}_4\text{H}_9 + \text{H}$	4.39	5
	$\text{n-C}_4\text{H}_{10} \rightleftharpoons \text{C}_2\text{H}_5 + \text{C}_2\text{H}_5$	3.45	49
iso-Butane	$\text{iso-C}_4\text{H}_{10} \rightleftharpoons \text{iso-C}_3\text{H}_7 + \text{CH}_3$	(3.84)	49
		3.47	71
	$\text{iso-C}_4\text{H}_{10} \rightleftharpoons \text{tert-C}_4\text{H}_9 + \text{H}$	3.87	5
Carbon tetrabromide	$\text{CBr}_4 \rightleftharpoons \text{CBr}_3 + \text{Br}$	2.16 ± 0.05	85
Carbon monochloride	$\text{CCl} \rightleftharpoons \text{C} + \text{Cl}$	(2.2)	13
Carbon dichloride	$\text{CCl}_2 \rightleftharpoons \text{CCl} + \text{Cl}$	3.45 ± 0.49	85

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(b) Organic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Carbon trichloride	$\text{CCl}_3 \rightleftharpoons \text{CCl}_2 + \text{Cl}$	2.73 2.36 ± 0.22	5 85
Carbon tetrachloride	$\text{CCl}_4 \rightleftharpoons \text{CCl}_3 + \text{Cl}$	3.30 ± 0.07 2.95 ± 0.13 3.12 ± 0.12	21 41 85
Carbon monofluoride	$\text{CF} \rightleftharpoons \text{C} + \text{F}$	4.96 4.6 ± 0.3	13 4
Carbon difluoride	$\text{CF}_2 \rightleftharpoons \text{C} + 2\text{F}$ $\text{CF}_2 \rightleftharpoons \text{CF} + \text{F}$	9.83 4.48 ± 0.59	79 85
Carbon trifluoride	$\text{CF}_3 \rightleftharpoons \text{CF}_2 + \text{F}$	4.94 ^b 4.4 5.43 ± 0.29	79 13 85
Carbon tetrafluoride	$\text{CF}_4 \rightleftharpoons \text{CF}_3 + \text{F}$	5.25 ± 0.20 5.05	41 79
Ethane	$\text{C}_2\text{H}_6 \rightleftharpoons \text{C}_2\text{H}_5 + \text{H}$ $\text{C}_2\text{H}_6 \rightleftharpoons \text{CH}_3 + \text{CH}_3$	4.21 3.64 ± 0.04	45 45
Ethyl	$\text{C}_2\text{H}_5 \rightleftharpoons \text{C}_2\text{H}_4 + \text{H}$	1.6	45
Ethyl alcohol	$\text{C}_2\text{H}_5\text{OH} \rightleftharpoons \text{C}_2\text{H}_5 + \text{OH}$ $\text{C}_2\text{H}_5\text{OH} \rightleftharpoons \text{C}_2\text{H}_5\text{O} + \text{H}$	3.86 4.29	71 71
Ethyl ether	$(\text{C}_2\text{H}_5)_2\text{O} \rightleftharpoons \text{C}_2\text{H}_5\text{O} + \text{C}_2\text{H}_5$	3.34	71
Ethylene	$\text{C}_2\text{H}_4 \rightleftharpoons \text{C}_2\text{H}_3 + \text{H}$ $\text{C}_2\text{H}_4 \rightleftharpoons \text{CH}_2 + \text{CH}_2$	4.51 (5.29)	45 45
Ethynyl	$\text{C}_2\text{H} \rightleftharpoons \text{C}_2 + \text{H}$	(5.7)	45

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(b) Organic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Formaldehyde	$\text{HCHO} \rightleftharpoons \text{CHO} + \text{H}$	3.3	5
Formyl	$\text{CHO} \rightleftharpoons \text{CO} + \text{H}$	1.2	5
	$\text{CHO} \rightleftharpoons \text{CH} + \text{O}$	^b 8.81 ± 0.12	13
Glyoxal	$\text{CHOCHO} \rightleftharpoons \text{CHO} + \text{CHO}$	≤2.84	89
Ketene	$\text{CH}_2\text{CO} \rightleftharpoons \text{CH}_2 + \text{CO}$	(3.5)	5
Methane	$\text{CH}_4 \rightleftharpoons \text{CH}_3 + \text{H}$	4.40	45
Methyl	$\text{CH}_3 \rightleftharpoons \text{CH}_2 + \text{H}$	3.8	5
Methylene	$\text{CH}_2 \rightleftharpoons \text{CH} + \text{H}$	5.4	5
Methyldiyne	$\text{CH} \rightleftharpoons \text{C} + \text{H}$	3.47	45
	$\text{CH}^+ \rightleftharpoons \text{C}^+ + \text{H}$	3.6	1
Methyl alcohol	$\text{CH}_3\text{OH} \rightleftharpoons \text{CH}_3\text{O} + \text{H}$	4.34	71
	$\text{CH}_3\text{OH} \rightleftharpoons \text{CH}_3 + \text{OH}$	3.95	50
		3.82	71
Methylamine	$\text{CH}_3\text{NH}_2 \rightleftharpoons \text{CH}_3\text{NH} + \text{H}$	(4.27)	71
	$\text{CH}_3\text{NH}_2 \rightleftharpoons \text{CH}_3 + \text{NH}_2$	3.47	71
Methyl bromide	$\text{CH}_3\text{Br} \rightleftharpoons \text{CH}_3 + \text{Br}$	2.33	50
		2.91	5
Methyl chloride	$\text{CH}_3\text{Cl} \rightleftharpoons \text{CH}_3 + \text{Cl}$	3.40	50
Methyl cyanide	$\text{CH}_3\text{CN} \rightleftharpoons \text{CH}_3 + \text{CN}$	4.47	50
Methyl ether	$(\text{CH}_3)_2\text{O} \rightleftharpoons \text{CH}_3\text{O} + \text{CH}_3$	3.34	71

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Continued

(b) Organic molecules - Continued

Name	Reaction	Energy, ev (a)	Reference
Methyl fluoride	$\text{CH}_3\text{F} \rightleftharpoons \text{CH}_3 + \text{F}$	4.64	5
Methyl iodide	$\text{CH}_3\text{I} \rightleftharpoons \text{CH}_3 + \text{I}$	2.30	5
Methylene bromide	$\text{CH}_2\text{Br}_2 \rightleftharpoons \text{CH}_2\text{Br} + \text{Br}$	2.59 ± 0.15	50
Methylene chloride	$\text{CH}_2\text{Cl}_2 \rightleftharpoons \text{CH}_2\text{Cl} + \text{Cl}$	3.19 ± 0.12	50
	$\text{CH}_2\text{Cl}_2 \rightleftharpoons \text{CHCl}_2 + \text{H}$	3.46 ± 0.20	50
Methyl zinc	$\text{CH}_3\text{Zn} \rightleftharpoons \text{CH}_3 + \text{Zn}$	1.5	5
Monomethyl hydrazine	$\text{CH}_3\text{N}_2\text{H}_3 \rightleftharpoons \text{CH}_3\text{NH} + \text{NH}_2$	2.9	63
Nitromethane	$\text{CH}_3\text{NO}_2 \rightleftharpoons \text{CH}_3 + \text{NO}_2$	(2.3)	5
n-Pentane	$\text{n-C}_5\text{H}_{12} \rightleftharpoons \text{n-C}_4\text{H}_9 + \text{CH}_3$	3.95	49
	$\text{n-C}_5\text{H}_{12} \rightleftharpoons \text{n-C}_3\text{H}_7 + \text{C}_2\text{H}_5$	3.67	49
neo-Pentane	$\text{neo-C}_5\text{H}_{12} \rightleftharpoons \text{neo-C}_5\text{H}_{11} + \text{H}$	4.13	5
Propane	$\text{C}_3\text{H}_8 \rightleftharpoons \text{n-C}_3\text{H}_7 + \text{H}$	4.36	49
	$\text{C}_3\text{H}_8 \rightleftharpoons \text{iso-C}_3\text{H}_7 + \text{H}$	(4.38)	49
		4.08	5
	$\text{C}_3\text{H}_8 \rightleftharpoons \text{C}_2\text{H}_5 + \text{CH}_3$	3.53	71
Propylene	$\text{C}_2\text{H}_3\text{CH}_3 \rightleftharpoons \text{C}_2\text{H}_3 + \text{CH}_3$	4.01	62
Toluene	$\text{C}_6\text{H}_5\text{CH}_3 \rightleftharpoons \text{C}_6\text{H}_5\text{CH}_2 + \text{H}$	3.36 ± 0.06	96
Tribromomethane	$\text{CHBr}_3 \rightleftharpoons \text{CHBr}_2 + \text{Br}$	2.67 ± 0.17	50

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE I.- BOND DISSOCIATION ENERGY VALUES - Concluded

(b) Organic molecules - Concluded

Name	Reaction	Energy, ev (a)	Reference
Trichlorofluoromethane	$\text{CCl}_3\text{F} \rightleftharpoons \text{CCl}_3 + \text{F}$	4.42 ± 0.30	5
Trichloromethane	$\text{CCl}_3\text{H} \rightleftharpoons \text{CCl}_3 + \text{H}$	3.86 ± 0.13	41
Trifluorochloromethane	$\text{CF}_3\text{Cl} \rightleftharpoons \text{CF}_3 + \text{Cl}$	3.60	5
Trifluoromethane	$\text{CF}_3\text{H} \rightleftharpoons \text{CF}_3 + \text{H}$	4.47 ± 0.20	41
Vinyl	$\text{C}_2\text{H}_3 \rightleftharpoons \text{C}_2\text{H}_2 + \text{H}$	1.69 1.8 ± 0.1	45 62

^aApproximate values shown in parentheses.^bCalculated from data in reference.

TABLE II.- IONIZATION POTENTIAL VALUES

(a) Atoms

Name	Symbol	First ionization potential, ev	Reference	Second ionization potential, ev	Reference
Actinium	Ac	6.89	6	11.5	6
Aluminum	Al	5.984	78	18.823	78
Antimony	Sb	8.639	78	16.7	6
Argon	Ar	15.755	78	27.62	78
Arsenic	As	9.81	78	20.2	78
Astatine	At	9.2	6	20.1	6
Barium	Ba	5.210	78	10.001	78
Beryllium	Be	9.320	78	18.206	78
Bismuth	Bi	7.287	78	19.3	78
Boron	B	8.296	78	25.149	78
Bromine	Br	11.84	78	21.6	78
Cadmium	Cd	8.991	78	16.904	78
Calcium	Ca	6.111	78	11.87	78
Carbon	C	11.264	78	24.376	78
Cerium	Ce	6.91	6	12.3	6
Cesium	Cs	3.893	78	25.1	78
Chlorine	Cl	13.01	78	23.80	78
Chromium	Cr	6.764	78	16.49	78
Cobalt	Co	7.86	78	17.05	78
Copper	Cu	7.724	78	20.29	78
Europium	Eu	5.67	78	11.24	78
Fluorine	F	17.418	78	34.98	78
Francium	Fr	3.98	6	22.5	6
Gallium	Ga	6.00	78	20.51	78
Germanium	Ge	7.88	78	15.93	78
Gold	Au	9.22	78	20.5	78
Hafnium	Hf	5.5	78	14.9	78
Helium	He	24.580	78	54.403	78
Hydrogen	H	13.595	78	-----	78
Indium	In	5.785	78	18.828	78
Iodine	I	10.44	78	19.0	78
Iridium	Ir	9.2	78	17.0	6
Iron	Fe	7.90	78	16.18	78
Krypton	Kr	13.996	78	24.56	78
Lanthanum	La	5.61	78	11.43	78
Lead	Pb	7.415	78	15.028	78
Lithium	Li	5.390	78	75.619	78
Lutetium	Lu	6.15	6	14.7	6
Magnesium	Mg	7.644	78	15.03	78
Manganese	Mn	7.432	78	15.64	78
Mercury	Hg	10.434	78	18.751	78

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(a) Atoms - Concluded

Name	Symbol	First ionization potential, ev	Reference	Second ionization potential, ev	Reference
Molybdenum	Mo	7.131	78	15.72	78
Neon	Ne	21.559	78	41.07	78
Nickel	Ni	7.633	78	18.15	78
Niobium	Nb	6.881	78	13.895	78
Nitrogen	N	14.54	78	29.605	78
Osmium	Os	8.7	78	17	6
Oxygen	O	13.614	78	35.146	78
Palladium	Pd	8.33	78	19.42	78
Phosphorus	P	10.55	78	19.65	78
Platinum	Pt	9.0	78	18.56	78
Polonium	Po	8.43	78	19.4	6
Potassium	K	4.339	78	31.81	78
Radium	Ra	5.277	78	10.14	78
Radon	Rn	10.745	78	21.4	6
Rhenium	Re	7.87	78	16.6	6
Rhodium	Rh	7.461	78	15.92	78
Rubidium	Rb	4.176	78	27.5	78
Ruthenium	Ru	7.365	78	16.597	78
Samarium	Sm	5.6	78	11.2	78
Scandium	Sc	6.56	78	12.80	78
Selenium	Se	9.75	78	21.5	78
Silicon	Si	8.149	78	16.34	78
Silver	Ag	7.574	78	21.48	78
Sodium	Na	5.138	78	47.29	78
Strontium	Sr	5.692	78	11.027	78
Sulfur	S	10.357	78	23.4	78
Tantalum	Ta	7.7	78	16.2	6
Technetium	Tc	7.23	78	14.87	78
Tellurium	Te	9.01	78	18.8	6
Thallium	Tl	6.106	78	20.42	78
Thorium	Th			11.5	6
Tin	Sn	7.332	78	14.63	78
Titanium	Ti	6.83	78	13.57	78
Tungsten	W	7.98	78	17.7	6
Uranium	U	4	78		
Vanadium	V	6.74	78	14.65	78
Xenon	Xe	12.127	78	21.21	78
Yttrium	Y	6.377	78	12.233	78
Zinc	Zn	9.391	78	17.96	78
Zirconium	Zr	6.835	78	12.916	78

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules

Name	Formula	Energy, ev (a)	Reference
Aluminum monoxide	AlO	$b_{9.5 \pm 0.5}$	30
Aluminum monoxide, dimer	Al ₂ O ₂	$b_{9.9 \pm 0.5}$	30
Aluminum suboxide	Al ₂ O	$b_{7.7 \pm 0.5}$	30
Amidogen	NH ₂	$b_{11.3}$	9
		$b_{11.4 \pm 0.1}$	42
Ammonia	NH ₃	$b_{10.52}$	9
		$c_{10.15 \pm 0.01}$	10
Antimony monochloride	SbCl	$b_{10.9}$	9
Beryllium monoxide	BeO	10.4 ± 0.2	66
Boron, diatomic	B ₂	$b_{12.06}$	44
Boron dibromide	BBr ₂	$b(7.0)$	64
Boron tribromide	BBr ₃	$b_{9.7 \pm 0.2}$	64
Boron monochloride	BCl	$b(10.44)$	64
Boron dichloride	BCl ₂	$b_{\leq 9}$	60
		$b(7.20)$	64
Boron trichloride	BCl ₃	$b_{12.0 \pm 0.5}$	9
		$b_{10.9 \pm 0.2}$	64
Boron difluoride	BF ₂	$b_{\leq 10}$	60
Boron trifluoride	BF ₃	$b_{15.7 \pm 0.1}$	60
Boron monohydride	BH	$b_{\leq 10.06}$	44

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Boron dihydride	BH ₂	^b 8.12	44
Boron trihydride	BH ₃	^b 11 to 12	44
Boron monoiodide	BI	^b (8.96)	64
Boron diiodide	BI ₂	^b (7.13)	64
Boron triiodide	BI ₃	^b 9.0 ± 0.2	64
Boron monoxide	BO	(12.8)	66
Boric oxide	B ₂ O ₃	^b (13.3)	105
Bromine	Br ₂	^c 10.55 ± 0.02	10
		^b 10.58 ± 0.08	23
		^b 10.92	9
Carbon, diatomic	C ₂	^b 12.0 ± 0.6	33
		^b 11.5 ± 0.1	9
Carbon, triatomic	C ₃	^b 12.6 ± 0.6	33
Carbon, tetratomic	C ₄	^b 12.6	33
Carbon, pentatomic	C ₅	^b 12.5 ± 1	33
Carbon monoxide	CO	^c 14.01 ± 0.01	10
		^d 14.013	10
		^b 14.1	9

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Carbon dioxide	CO ₂	^b 13.85	9
		^c 13.79 ± 0.01	10
		^d 13.79	10
Carbon oxysulfide	COS	^c 11.17 ± 0.01	77
Carbon monosulfide	CS	^b 10.7 ± 0.3	9
		11.9 ± 0.3	113
Carbon disulfide	CS ₂	^b 10.13 ± 0.02	9
		^c 10.08 ± 0.01	10
		^d 10.079	10
Chlorine	Cl ₂	^b 11.80	9
		^c 11.48 ± 0.01	10
		^b 11.64 ± 0.05	23
Chlorine monoxide	ClO	^b ≤10.4	52
Chlorine dioxide	ClO ₂	^b ≤11.1	52
Chlorine trioxide	ClO ₃	^b ≤11.7	52
Cyano	CN	^b 14.6	38
		^b 14.5 ± 0.5	37
		^b 14.55 or 13.42	39
		^b 14.0	9
Cyanoacetylene	HC ₃ N	14.2 ± 0.3	86
		^b 11.6 ± 0.2	37

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Cyanogen	C_2N_2	$b_{13.6 \pm 0.2}$	37
		$b_{13.57 \pm 0.02}$	38
		$d_{13.8}$	10
-----	C_2N	$b_{12.8}$	37
Cyanogen bromide	CNBr	$b_{11.95 \pm 0.08}$	38
Cyanogen chloride	CNCl	$b_{12.49 \pm 0.04}$	38
Cyanogen iodide	CNI	$b_{10.98 \pm 0.05}$	38
Decaborane	$B_{10}H_{14}$	$b_{11.0 \pm 0.5}$	59
Dibarium monoxide	Ba_2O	$b(4.0)$	109
Diborane	B_2H_6	$b_{11.9 \pm 0.1}$	44
Diboron monohydride	B_2H	$b(10.62)$	44
Diboron dihydride	B_2H_2	$b(11.36)$	44
Diboron trihydride	B_2H_3	$b(8.79)$	44
Diboron tetrahydride	B_2H_4	$b(10.93)$	44
Diboron pentahydride	B_2H_5	$b_{7.86}$	44
Diboron dioxide	B_2O_2	$b(13.3)$	105
Dicyanoacetylene	C_4N_2	$b_{11.4 \pm 0.2}$	37
-----	C_4N	$b_{12.3}$	37

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Dicyanodiacetylene	C_6N_2	$b_{11.4 \pm 0.2}$	37
Difluoroamino	NF_2	11.8 $b_{12.0 \pm 0.1}$	15 84
Difluorodiazine (trans)	trans N_2F_2	$b_{13.1 \pm 0.1}$	84
Diimide	N_2H_2	$b_{9.85 \pm 0.1}$	42
Disilicon dioxide	Si_2O_2	$b_{10 \pm 1.0}$	9
Fluorine	F_2	$d_{15.7}$ $b_{16.6 \pm 0.2}$ $b_{15.83 \pm 0.05}$	10 32 23
Hydrazine	N_2H_4	$b_{9.00 \pm 0.1}$	63
Hydrazyl	N_2H_3	$b_{7.88 \pm 0.2}$	42
Hydrogen	H_2	$b_{15.44}$ $d_{15.427}$ $c_{15.4}$	9 9 9
Hydrogen bromide	HBr	$c_{11.62 \pm 0.01}$ $b_{11.69}$	10 9
Hydrogen chloride	HCl	$d_{12.90}$ $c_{12.74 \pm 0.01}$ $b_{12.8 \pm 0.1}$	9 10 32

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Hydrogen cyanide	HCN	^b 13.86	9
Hydrogen fluoride	HF	^b 16.38 ± 0.05	9
		^b 16.0 ± 0.2	32
		^b 15.77	10
Hydrogen iodide	HI	^c 10.38 ± 0.02	10
		^d 10.39	9
		^b 10.37	9
Hydrogen peroxide	H ₂ O ₂	^b 11.26 ± 0.05	31
		^b 12.1 ± 0.3	9
Hydrogen persulfide	H ₂ S ₂	^b 10.2	100
Hydroperoxy	HO ₂	^b 11.53 ± 0.1	40
Hydrogen sulfide	H ₂ S	^b 10.5	9
		^c 10.46 ± 0.01	10
		^d 10.47	10
Hydroxyl	OH	^b 13.53 ± 0.08	31
		^b 13.49 ± 0.08	46
		^b 13.18	10
Imidogen	NH	^b ≤16.4	94
Iodine	I ₂	^b 9.41	9
		^c 9.28 ± 0.02	10
Lanthanum monoxide	LaO	^b 4.8 ± 0.5	106

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Lithium iodide	LiI	$b8.55 \pm 0.15$	9
Lithium monoxide	LiO	9.0 ± 0.5	66
Molybdenum monoxide	MoO	$b8.0 \pm 0.6$	58
Molybdenum dioxide	MoO ₂	$b9.4 \pm 0.6$	58
Nitric oxide	NO	$c9.25 \pm 0.02$	10
		$d9.24$	10
		$b9.4 \pm 0.2$	9
Nitrogen	N ₂	$b15.60 \pm 0.01$	9
		$d15.580$	10
Nitrogen monofluoride	NF	$b \leq 12.4 \pm 0.3$	84
Nitrogen trifluoride	NF ₃	$c12.91$	56
		$b13.2 \pm 0.2$	108
Nitrogen dioxide	NO ₂	$b10.0$	9
		$c9.78 \pm 0.05$	10
		$d12.3$	10
Nitrous oxide	N ₂ O	$c12.90 \pm 0.01$	10
		$b12.9 \pm 0.5$	9
		$d12.94$	10
Oxygen	O ₂	$c12.075 \pm 0.01$	10
		$d12.2 \pm 0.2$	10
		$b12.1 \pm 0.2$	9

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Oxygen fluoride	OF	^b 13.0 ± 0.2	43
Oxygen bifluoride	OF ₂	^b 13.7 ± 0.2	43
Ozone	O ₃	^b 12.80	10
Pentaborane	B ₅ H ₉	^b 10.8 ± 0.5	59
Perchlorylfluoride	ClO ₃ F	^b (13.6)	52
Phosphorus trichloride	PCl ₃	^b 12.3	9
Phosphorus trihydride	PH ₃	^b 10.0	9
Potassium iodide	KI	^b 8.3 ± 0.2	9
Selenium dihydride	SeH ₂	^d 9.88	10
Silicon tetrachloride	SiCl ₄	^b 11.6 ± 0.2	9
Silicon monofluoride	SiF	^d 7.26	61
Silicon tetrafluoride	SiF ₄	^b 15.4 ± 0.4	57
Silicon tetrahydride	SiH ₄	^b 12.2 ± 0.3	9
Silicon monoxide	SiO	^b 10.8 ± 0.5	9
Silicon dioxide	SiO ₂	^b 11.7 ± 0.5	9
Sodium hydroxide	NaOH	^b (9.0)	103

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Sodium iodide	NaI	^b 8.8 ± 0.3	9
Sulfur, diatomic	S ₂	^b 10.8 ± 0.3 10.3 ± 0.2	9 113
Sulfur pentafluoride	SF ₅	^b ≤12.7	60
Sulfur hexafluoride	SF ₆	19.3 20.1	72 110
Sulfur monohydride	SH	^b 11.1	9
Sulfur monoxide	SO	^b ≤11.0 12.1 ± 0.3	92 113
Sulfur dioxide	SO ₂	^b 13.4 ± 0.3 ^c 12.34 ± 0.02 ^d 12.05	9 10 9
Sulfuryl fluoride	SO ₂ F ₂	^b 13.3 ± 0.1	92
Tellurium dihydride	TeH ₂	^d 9.14	10
Tetrafluorohydrazine	N ₂ F ₄	^b 12.04 ± 0.10	57
Titanium tetrachloride	TiCl ₄	^b 11.7 ± 0.2	9
Triazene	N ₃ H ₃	^b 9.6 ± 0.1	42
Tungsten monoxide	WO	^b 9.1 ± 1	58
Tungsten dioxide	WO ₂	^b 9.9 ± 0.6	58

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(b) Inorganic molecules - Concluded

Name	Formula	Energy, ev (a)	Reference
Uranium tetrachloride	UCl ₄	^b 11.5	9
Uranium hexafluoride	UF ₆	15.5	72
Uranium monoxide	UO	^b 4.7 ± 0.6	58
Uranium dioxide	UO ₂	^b 4.3 ± 0.6	58
Water	H ₂ O	^b 12.69 ± 0.08	31
		^c 12.59 ± 0.01	10
		^b 12.67	9
		^d 12.61	10
Zirconium monoxide	ZrO	^b (5.5)	107
Zirconium dioxide	ZrO ₂	8 ± 0.5	107

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules

Name	Formula	Energy, ev (a)	Reference
Acetaldehyde	CH_3CHO	$^c10.21 \pm 0.01$	10
Acetic acid	$\text{CH}_3\text{CO}_2\text{H}$	$^c10.37 \pm 0.03$	10
Acetone	$(\text{CH}_3)_2\text{CO}$	$^c9.69 \pm 0.01$	10
Acetyl	CH_3CO	$^b7.92$ $^b8.08 \pm 0.09$	9 89
Acetylene	C_2H_2	$^b11.42$ $^c11.41 \pm 0.01$ $^d11.41$	9 10 10
Acetyl chloride	CH_3COCl	$^c11.02 \pm 0.05$	10
Allyl	C_3H_5	$^b8.16$	9
Aniline	$\text{C}_6\text{H}_5\text{NH}_2$	$^c7.70 \pm 0.02$	10
Benzene	C_6H_6	$^c9.245 \pm 0.01$	10
Benzonitride	$\text{C}_6\text{H}_5\text{CN}$	$^c9.705 \pm 0.005$	10
Benzyl	$\text{C}_6\text{H}_5\text{CH}_2$	$^b7.73$	9
Bromomethyl	CH_2Br	$^b8.34 \pm 0.11$	50
n-Butane	$\text{n-C}_4\text{H}_{10}$	$^c10.63 \pm 0.05$	10
iso-Butane	$\text{iso-C}_4\text{H}_{10}$	$^c10.57$	10

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
1-Butene	1-C ₄ H ₈	^c 9.58 ± 0.01	10
n-Butyl	n-C ₄ H ₉	^b 8.64 ± 0.05	51
iso-Butyl	iso-C ₄ H ₉	^b 8.35 ± 0.05	51
sec-Butyl	sec-C ₄ H ₉	^b 7.93 ± 0.05	51
tert-Butyl	tert-C ₄ H ₉	^b 7.42 ± 0.05 ^b 6.90 ± 0.1	51 9
1-Butyne	C ₄ H ₆	^c 10.18 ± 0.01	10
Carbon monobromide	CBr	^b 10.43 ± 0.02	85
Carbon dibromide	CBr ₂	^b 10.11 ± 0.09	85
Carbon monochloride	CCl	^b 12.9 ± 0.10	85
Carbon dichloride	CCl ₂	^b 13.10 ± 0.08	85
Carbon dichlorofluoride	CCl ₂ F	^b 8.69 ± 0.15	29
Carbon trichloride	CCl ₃	^b 8.78 ± 0.05 ^b 7.92 ± 0.35	41 29
Carbon tetrachloride	CCl ₄	^c 11.47 ± 0.01	10
Carbon monofluoride	CF	^b 13.81 ± 0.12	85
Carbon difluoride	CF ₂	^b 13.30 ± 0.12	85

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Carbon trifluoride	CF ₃	^b 8.9 ^b 10.10 ± 0.05	9 41
Carbon tetrafluoride	CF ₄	17.8	72
Carbon monoiodide	CI	^b ≤10.8	38
Carbonyl chloride	COCl ₂	^b 11.77	9
Chlorobenzene	C ₆ H ₅ Cl	^c 9.07 ± 0.02	10
Chloromethyl	CH ₂ Cl	^b 9.70 ± 0.09	50
Cyanomethyl	CH ₂ CN	^b 9.87	60
Cyclobutane	C ₄ H ₈	^b 10.58	65
Cyclobutyl	C ₄ H ₇	^b 7.88 ± 0.05	65
Cyclohexane	C ₆ H ₁₂	^c 9.88 ± 0.02	10
Cyclohexene	C ₆ H ₁₀	^c 8.945 ± 0.01	10
Cyclohexyl	C ₆ H ₁₁	^b 7.66 ± 0.05	65
Cyclopentane	C ₅ H ₁₀	^c 10.53 ± 0.05	10
Cyclopentyl	C ₅ H ₉	^b 7.79 ± 0.03	65
Cyclopropane	C ₃ H ₆	^c 10.06 ± 0.03	10

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Cyclopropyl	C_3H_5	${}^b8.05 \pm 0.1$	65
Dibromomethyl	$CHBr_2$	${}^b8.13 \pm 0.16$	50
Dichloromethyl	$CHCl_2$	${}^b9.54 \pm 0.10$	50
Diethyl amine	$(C_2H_5)_2NH$	${}^c8.01$	10
Diethyl ether	$(C_2H_5)_2O$	${}^c9.53 \pm 0.03$	10
Diethyl sulfide	$(C_2H_5)_2S$	${}^c8.430 \pm 0.005$	10
Difluorobromomethane	$CHBrF_2$	${}^b12.1 \pm 0.2$	9
Difluorodibromomethane	CF_2Br_2	${}^c11.07 \pm 0.03$	10
Difluorodichloroethylene	$C_2F_2Cl_2$	${}^b10.0 \pm 0.2$	83
Dimethyl borane	$B(CH_3)_2$	${}^b(6.44)$	64
Dimethoxy borane	$HB(OCH_3)_2$	${}^b9.7 \pm 1.0$	104
Ethane	C_2H_6	${}^c11.65 \pm 0.03$	10
Ethyl	C_2H_5	${}^b8.72$ ${}^c \leq 8.4$	9 93
Ethyl alcohol	C_2H_5OH	${}^c10.48 \pm 0.05$	10
Ethyl amine	$C_2H_5NH_2$	${}^c8.86$ ${}^b9.32$	10 9

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Ethylene	C_2H_4	^b 10.56	9
		^c 10.515 ± 0.01	10
		^d 10.51	10
Ethylene oxide	$(CH_2)_2O$	^c 10.565 ± 0.01	10
Ethyldecaborane	$C_2H_5B_{10}H_{13}$	^b 9.0 ± 0.5	59
Ethynyl	C_2H	11.3	111
Formaldehyde	HCHO	^c 10.87 ± 0.01	10
Formamide	HCONH ₂	^c 10.25 ± 0.02	10
Formic acid	H ₂ CO ₂	^c 11.05 ± 0.01	10
Formyl	CHO	^b (8.8)	9
		^b (10.0)	9
		^b 9.88 ± 0.05	89
Freon 11	CFCl ₃	^c 11.77 ± 0.02	10
Freon 12	CF ₂ Cl ₂	^c 12.31 ± 0.05	10
Freon 13	CClF ₃	^c 12.91 ± 0.03	10
Freon 22	CHClF ₂	^c 12.45 ± 0.05	10
Freon 113	CF ₃ CCl ₃	^c 11.78 ± 0.03	10
Genetron 101	CH ₃ CF ₂ Cl	^c 11.98 ± 0.01	10

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
n-Heptane	n-C ₇ H ₁₆	^c 10.08	10
n-Hexane	n-C ₆ H ₁₄	^c 10.18	10
Methane	CH ₄	^c 12.98 ± 0.01 ^b 13.12	10 9
Methanethiol	CH ₃ SH	^c 9.440 ± 0.005	10
Methyl	CH ₃	^d 9.840 ^b 9.96 ^c 9.82 ± 0.04 ^d 9.843	10 9 93 112
Methyl acetate	CH ₃ CO ₂ CH ₃	^c 10.27 ± 0.02	10
Methyl alcohol	CH ₃ OH	^c 10.85 ± 0.02	10
Methyl amine	CH ₃ NH ₂	^c 8.97	10
Methyl borane	B(CH ₃)	^b (9.28)	64
Methyl bromide	CH ₃ Br	^c 10.53 ± 0.01	10
Methyl chloride	CH ₃ Cl	^c 11.28 ± 0.01	10
Methyl cyanide	CH ₃ CN	^c 12.23 ± 0.01 ^b 12.46	10 9
Methyl fluoride	CH ₃ F	^b 12.72	9

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
Methyl iodide	CH ₃ I	^c 9.54 ± 0.01	10
Methyl sulfide	CH ₃ S	^b 8.2	9
Methyl thiocyanate	CH ₃ SCN	^c 10.065 ± 0.01	10
Methylene	CH ₂	^b 11.9 ^d 10.396 ± 0.003	9 112
Methylene bromide	CH ₂ Br ₂	^c 10.49 ± 0.02	10
Methylene chloride	CH ₂ Cl ₂	^c 11.35 ± 0.02	10
Methylidyne	CH	^d 11.13	9
Monomethyl hydrazine	CH ₃ N ₂ H ₃	^b 8.63 ± 0.1	63
Nitromethane	CH ₃ NO ₂	^c 11.08 ± 0.03	10
n-Octane	n-C ₈ H ₁₈	^b 10.24	9
n-Pentane	n-C ₅ H ₁₂	^c 10.35	10
iso-Pentane	iso-C ₅ H ₁₂	^c 10.32	10
neo-Pentane	neo-C ₅ H ₁₂	^c 10.35	10
2-Pentyl	2-C ₅ H ₁₁	^b 7.73	87
3-Pentyl	3-C ₅ H ₁₁	^b 7.86	87

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Continued

(c) Organic molecules - Continued

Name	Formula	Energy, ev (a)	Reference
neo-Pentyl	neo-C ₅ H ₁₁	^b 8.33	87
tert-Pentyl	tert-C ₅ H ₁₁	^b 7.12	87
Phenol	C ₆ H ₅ OH	^c 8.50 ± 0.01	10
Phenyl	C ₆ H ₅	^b 9.89	9
Propane	C ₃ H ₈	^c 11.07 ± 0.05	10
Propargyl	C ₃ H ₃	^b 8.25 ± 0.08	9
n-Propyl	n-C ₃ H ₇	^b 8.69 ± 0.05	51
		^c 7.45	49
		^b 8.4	9
		^c ≤8.1	93
iso-Propyl	iso-C ₃ H ₇	^b 7.90 ± 0.05	51
		^c 7.20	49
		^c ≤7.5	93
Propylene	C ₃ H ₆	^c 9.73 ± 0.01	10
Propyne	C ₃ H ₄	^c 10.36 ± 0.01	10
Tetrachloroethylene	C ₂ Cl ₄	^c 9.32 ± 0.01	10
Tetrafluoroethylene	C ₂ F ₄	^b 9.3 ± 0.2	83

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE II.- IONIZATION POTENTIAL VALUES - Concluded

(c) Organic molecules - Concluded

Name	Formula	Energy, ev (a)	Reference
Toluene	$C_6H_5CH_3$	^c 8.82 ± 0.01	10
Trichloromethane	CCl_3H	^c 11.42 ± 0.03	10
Triethyl amine	$(C_2H_5)_3N$	^c 7.50 ^b 9.1 ± 0.2	10 9
Triethyl borane	$B(C_2H_5)_3$	^b 9.0 ± 0.2	104
Trifluorochloroethylene	C_2F_3Cl	^b 10.4 ± 0.2	83
Trifluoroiodoethane	CF_3CH_2I	^c 10.00 ± 0.01	10
Trimethoxy borane	$B(OCH_3)_3$	^b 8.9 ± 0.2	104
Trimethyl borane	$B(CH_3)_3$	^b 8.8 ± 0.2	104
Vinyl	C_2H_3	^b 9.45 ± 0.05	62
Vinyl chloride	CH_2CHCl	^c 9.995 ± 0.01	10
p-Xylene	$C_6H_4(CH_3)_2$	^c 8.445 ± 0.01	10
p-Xylyl	$CH_3C_6H_4CH_2$	^b 7.46 ± 0.03	9

^aApproximate values shown in parentheses.^bElectron impact technique.^cPhotoionization technique.^dSpectroscopic technique.

TABLE III.- ELECTRON AFFINITY VALUES

Name	Formula	Energy, ev (a)	Reference
Aluminum	Al	0.52	18
Amidogen	NH ₂	1.2 ± 0.4	95
Boron	B	0.33	18
Boron trifluoride	BF ₃	2.17	12
Bromine	Br	3.53 ± 0.12 3.49 ± 0.05 3.54 ± 0.06 3.51 ± 0.06	22 80 12 97
Carbon	C	1.24 1.12 ± 0.05 1.25 ± 0.03	18 24 76
Carbon, diatomic	C ₂	3.1 or 4.0	47
Carbon, triatomic	C ₃	1.8 or 2.5	47
Carbon trichloride	CCl ₃	≥2.10	29
Chlorine	Cl	3.75 ± 0.09 3.71 ± 0.05 3.82 ± 0.06 3.65 ± 0.01	97 80 12 91
Chlorine monoxide	ClO	2.90	12
Chlorine dioxide	ClO ₂	3.42	12
-----	ClO ₂ F	≥2.7	52
Chlorine trioxide	ClO ₃	3.96	12
Chlorine tetraoxide	ClO ₄	5.81	12
Cyano	CN	3.2 ± 0.2 3.6 ± 0.4	38 12

^aApproximate values shown in parentheses.

TABLE III.- ELECTRON AFFINITY VALUES - Continued

Name	Formula	Energy, ev (a)	Reference
-----	C_3N	2.4	37
Ethyl	C_2H_5	0.9	88
Fluorine	F	3.58 ± 0.09 3.45 ± 0.05 3.62 ± 0.08 3.50	97 80 12 18
Hydrogen	H	0.747	11
Hydrogen sulfide	H_2S	1.11 ± 0.08	99
Hydroperoxy	HO_2	3.03	12
Hydroxyl	OH	2.8 ± 0.2 2.17	28 12
Iodine	I	3.076 ± 0.005 3.13 ± 0.12 3.19 ± 0.05 3.23 ± 0.06 3.17 ± 0.07	102 22 80 12 97
Lithium	Li	0.82 0.54	18 12
Mercury	Hg	1.54	12
Methyl	CH_3	(1.08) 1.1	9 88
Methylidyne	CH	(1.6) 0.9	12 9
Nitrogen dioxide	NO_2	1.62	12
Nitrogen trioxide	NO_3	3.88	12
Oxygen	O	1.465 ± 0.005	24

^aApproximate values shown in parentheses.

TABLE III.- ELECTRON AFFINITY VALUES - Concluded

Name	Formula	Energy, ev (a)	Reference
Oxygen, diatomic	O ₂	0.15 0.87 ± 0.12 0.46 ± 0.02	36 12 74
Ozone	O ₃	2.9	12
Phosphorus	P	0.77	18
Potassium	K	0.69	12
n-Propyl	n-C ₃ H ₇	0.7	88
Selenium monohydride	HSe	1.08	9
Silicon	Si	1.46	18
Sodium	Na	0.47	18
Sulfur	S	2.15 2.07 ± 0.07 2.08 ± 0.02	18 73 99
Sulfur pentafluoride	SF ₅	3.39	19
Sulfur monohydride	SH	2.60 2.30 ± 0.04 1.65	12 99 9
Sulfur monoxide	SO	1.52 to 2.56 0.74	9 92
Sulfur dioxide	SO ₂	2.80	12

^aApproximate values shown in parentheses.