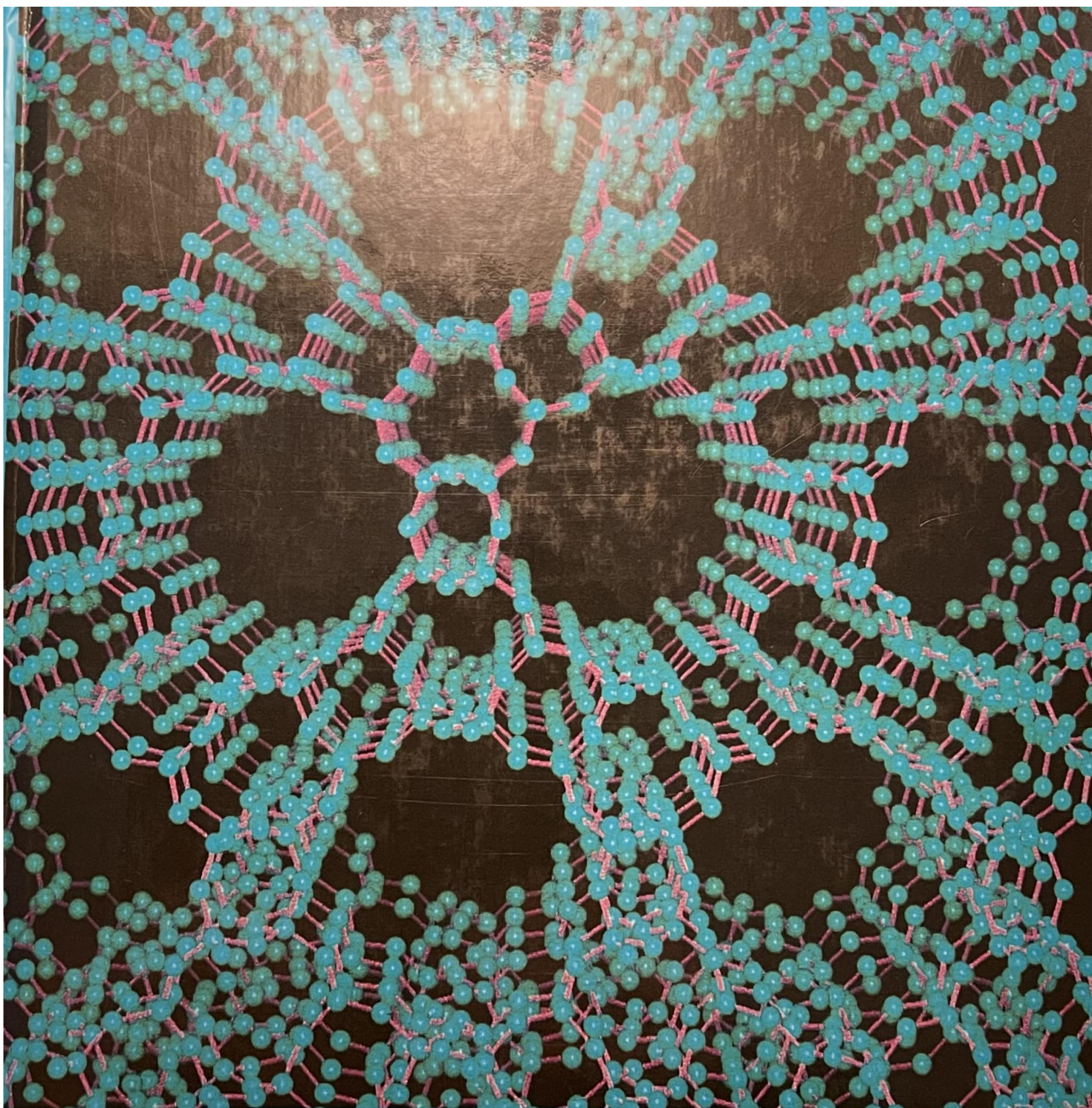




Fourth Edition
Inorganic Chemistry

**Principles of Structure
and Reactivity**

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Ellen A. Keiter
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Fourth Edition

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About the Cover

The crystal structure of *boggsite*, a recently discovered natural zeolite, is composed of sodium, calcium, aluminum, silicon, hydrogen, and oxygen. Its unique atomic structure of ten and twelve rings was determined by J. J. Pluth and J. V. Smith, geophysicists at the University of Chicago. Modeling tools used to construct the cover photograph are being developed in the Catalysis and Sorption Project of BIOSYM Technologies, Inc., San Diego, California. Structure of boggsite courtesy of Pluth, J. J.; Smith, J. V. *Am. Mineral.* **1990**, 75, 501-507, and computer graphic by John M. Newsam, BIOSYM Technologies, Inc.

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Table 10.4

Donor number (DN), acceptor number (AN), and relative permittivity (dielectric constant, ϵ/ϵ_0) of selected solvents^{a,b}

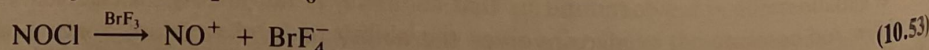
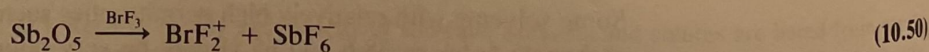
Solvent	DN	AN	ϵ/ϵ_0
Acetic acid	—	52.9	6.2
Acetone	17.0	12.5	20.7
Acetonitrile	14.1	19.3	36
Antimony pentachloride	—	100.0	—
Benzene	0.1	8.2	2.3
Carbon tetrachloride	—	8.6	2.2
Chloroform	—	23.1	4.8
Dichloromethane	—	20.4	—
Diethyl ether	19.2	3.9	4.3
Dimethylacetamide	27.3	13.6	37.8
Dimethylformamide (dmf)	24.0	16.0	36.7
Dimethylsulfoxide (dmsO)	29.8	19.3	45
Dioxane	14.8	10.8	2.2
Hexamethylphosphoric triamide (hmpa)	38.8	10.6	—
Nitromethane	2.7	20.5	38.6
Phosphorus oxychloride	11.7	—	—
Propylene carbonate	15.1	—	65.1
Pyridine (py)	33.1	14.2	12.3
Tetrahydrofuran	20.0	8.0	7.3
Trifluoroacetic acid	—	105.3	—
Trifluorosulfonic acid	—	129.1	—
Water	18	54.8	81.7

^a The ratio ϵ/ϵ_0 is more convenient to use than the value of the permittivity in absolute units.

^b From Gutmann, V. *Chimia*, 1977, 31, 1; *The Donor-Acceptor Approach to Molecular Interactions*; Plenum: New York, 1978. Used with permission.

to include an *acceptor number* (AN), that measures the electrophilic behavior of a solvent (Table 10.4).¹³ Drago¹⁴ has criticized the donor-number concept because it does not go far enough in accounting for differences in hardness and softness (or electrostatic and covalent differences). By limiting the evaluation of donor numbers to a single acid (SbCl_5), the donor-number system in effect presents only half of the information available from the $E_A E_B + C_A C_B$ four-parameter equation.

The third group of solvents consists of those that are highly polar and autoionizing. They are usually highly reactive and are difficult to keep pure because they react with traces of moisture and other contaminants. Some even react slowly with silica containers or dissolve electrodes of gold and platinum. An example of one of the more reactive of these solvents is bromine trifluoride. Nonfluoride salts, such as oxides, carbonates, nitrates, iodates, and other halides, are fluorinated:



¹³ Gutmann, V. *Electrochim. Acta* 1976, 21, 661–670; *Chimia* 1977, 31, 1–7.

¹⁴ Drago, R. S. *Inorg. Chem.* 1990, 29, 1379–1382.