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Reviews and Monographs on the Chemistry of Sulfur Compounds

(ordered chronologically)

E. Thieler, *Schwefel*, Theodor Steinkopff, Dresden, **1936**, 132 Seiten (technology of elemental sulfur during the period 1840-1935).

A. Kurtenacker, *Analytische Chemie der Sauerstoffsäuren des Schwefels*, F. Enke Verlag, Stuttgart, **1938**.

M. Goehring, *Die Chemie der Polythionsäuren*, *Fortschr. Chem. Forsch. (Top. Curr. Chem.)* **1952**, 2, 444-483.

Gmelin Handbook of Inorganic Chemistry, 8th ed., *Sulfur*, Springer, Berlin; many volumes:

1953: Hydrides and Oxides of Sulfur (in German)

1953: Elemental Sulfur (in German)

1953: Occurrence and Technology of Sulfur and Its Compounds (in German)

1960: Sulfur Oxoacids (in German)

1963: Sulfur Compounds with Nitrogen, Oxygen and Halides (in German)

1977: Sulfur-Nitrogen Compounds, Part 1 (in German)

1978: Sulfur Halides (in German)

1978: Thionyl Halides (in German)

1980: Sulfur Oxides (in German)

1983: Sulfanes (in English)

1985-1994: Sulfur-Nitrogen Compounds, Parts 2–10 (in English)

F. Feher, *Über den Schwefel und seine Verbindungen* (Review), *Angew. Chem.* **1955**, 67, 337-344.

A. J. Parker, N. Kharasch, *The Scission of the Sulfur-Sulfur Bond*, *Chem. Rev.* **1959**, 59, 583-628.

M. Bamberg, *Thermodynamische und experimentelle Untersuchung der Löslichkeit von rhombischem Schwefel in organischen Lösungsmitteln*, Dissertation, Saarbrücken, **1959**.

N. Kharasch (ed.), *Organic Sulfur Compounds*, Vol. 1, Pergamon, Oxford, **1961**; with the following Chapters:

1. J. Donohue, The Structures of Elemental Sulfur
2. H. B. Van der Heijde, The Inorganic Acids of Sulfur
3. J. P. McCullough, D. W. Scott, G. Waddington, Thermodynamics of Organic Sulfur Compounds
4. A. B. Burg, Bonding Characteristics of the Sulfur Atom
5. W. H. Saunders, Some Applications of Isotopic Sulfur
6. J. L. Bellamy, Infrared Spectra of Organo Sulfur Compounds
7. R. C. Passerini, Ultraviolet Absorption Spectra of Organic Sulfur Compounds
8. O. Foss, Stereochemistry of Disulfides and Polysulfides
9. O. Foss, Ionic Scission of the Sulfur-Sulfur Bond
10. D. S. Tarbell, The Mechanism of Oxidation of Thiols to Disulfides
11. A. J. Parker, Sulfur Nucleophiles in Aromatic S_N -Reactions
12. W. E. Truce, Nucleophilic Reactions of Thiols with Acetylenes and Chloroethylenes
13. G. Brindell, S. J. Cristol, Additions of Thiols and Related Substances to Bridged Bicyclic Olefins
14. E. Campaigne, Addition of Thiols or Hydrogen Sulfide to Carbonyl Compounds
15. J. Strating, The Sulfonyl Group and its Effects in Organic Compounds
16. H. H. Szmant, Chemistry of the Sulfoxide Group
17. W. O. Ranky, D. C. Nelson, Dimethyl Sulfoxide
18. A. Mustafa, Sultones and Sultams
19. L. N. Owen, Dithiols
20. L. Bateman, C. G. Moore, Reactions of Sulfur with Olefins
21. D. Barnard, L. Bateman, J. E. Cunneen, Oxidation of Organic Sulfides
22. W. E. Parham, The Chemistry of 1,4-Dithiadene and Related Compounds
23. J. F. Arens, Some Aspects of the Chemistry of Organic Sulfides
24. E. M. Fettes, Progress in Polysulfide Polymers
25. A. Burawoy, Ortho-Mercaptoazo Compounds
26. J. D. Loudon, Extrusion of Sulfur
27. R. G. R. Bacon, Thiocyanates, Thiocyanogen and Related Compounds

28. S. J. Assony, The Chemistry of Isothiocyanates
 29. F. Challenger, The Properties of some N-Chloroamides (Chloroamins) and Sulfilimines
 30. I. B. Douglass, The Alkenesulfenyl Chlorides and Related Compounds
 31. F. A. Drahowzal, Trichloromethanesulfenyl Chloride and Trichloromethanesulfonyl Chloride
 32. N. Kharasch, Sulfenium Ions and Sulfenyl Compounds
 33. F. Chatagner, Enzymic Reactions of Sulfur Compounds
 34. A. Kjaer, Naturally Occurring Isothiocyanates and their Parent Glycosides
 35. T. C. Bruce, The Chemistry and Biochemistry of the Acyl Thiols
 36. L. J. Reed, Lipoic Acid
 37. C. M. Buess, Recent Studies of Methionine and Cysteine
 38. E. C. Stowell, Ergothioneine
 39. F. Kurzer, Sulfonylureas and Related Compounds
 40. H. Plaut, Sulfur Derivatives of Purines and Pyrimidines
- Appendix: A Long List of Books and Symposia Monographs on Organic Sulfur Compounds*

B. Meyer, *Elemental Sulfur: Chemistry and Physics*, Interscience, New York, **1965**; with Chapters on the following topics and numerous references:

1. Nomenclature of Sulfur Allotropes
2. Structures of Solid Sulfur Allotropes
3. Phase Transition Rate Measurements
4. Preparation and Properties of Sulfur Allotropes
5. Properties of Polymeric Sulfur
6. Physical Properties of Liquid Sulfur
7. Molecular Composition of Sulfur Vapor
8. Mechanical Properties of Sulfur
9. High Pressure Behavior of Sulfur
10. Electrical and Photoconductive Properties of Orthorhombic Sulfur Crystals
11. ESR Studies of Unstable Sulfur Forms
12. Vibrational Spectra of Elemental Sulfur
13. Electronic Spectrum and Electronic States of S₂
14. Reactions of Atomic Sulfur
15. Reactions of the Sulfur-Sulfur Bond
16. Preparation of Unusual Sulfur Rings

17. Liquid Solutions of Sulfur
18. Potential Applications of Sulfur

N. Kharasch, C. Y. Meyers (eds.), *Organic Sulfur Compounds*, Vol. 2, Pergamon, Oxford, **1966**; with the following Chapters:

1. H. A. Bent, Electron Correlation and Bond Properties in Some Selected Sulfur Compounds
2. W. A. Bonner, R. A. Grimm, Mechanism of Raney Nickel Desulfuration
3. A. Fava, Isomerization of Organic Thiocyanates
4. L. Goodman, E. J. Reist, Recent Aspects of Olefin Sulfide Chemistry
5. J. L. Kice, Desulfonylation Reactions
6. R. E. Banks, R. N. Hazeldine, Polyfluoroalkyl Derivatives of Sulfur
7. W. Drenth, Properties of 1-Alkynyl Thioethers
8. A. A. Oswald, T. J. Wallace, Anionic Oxidation and Co-oxidation of Thiols with Olefins
9. A. A. Oswald, K. Griesbaum, Diradical Additions of Thiols to Diolefins and Acetylenes
10. N. Lozach, J. Vialle, The Chemistry of the 1,2-Dithiole Ring
11. J. T. Edward, Thiohydantoins
12. H. Tilles, Thiophosgene
13. J. P. Danehy, The Alkaline Decomposition of Aliphatic Disulfides
14. O. Gawron, On the Reaction of Cyanide with Cystine and Cystine Peptides
15. W. E. Sawige, J. E. Maclaren, Oxidation of Disulfides with Special Reference to Cystine
16. *Appendix*: Updated List of Books, Reviews and Symposia on Sulfur Chemistry

F. Tuinstra, *Structural Aspects of the Allotropy of Sulfur and the Other Divalent Elements*, Waltman, Delft, **1967**.

G. Nickless (ed.), *Inorganic Sulfur Chemistry*, Elsevier, Amsterdam, **1968**; with Chapters on the following topics:

1. The Sulfur Atom and its Nucleus (G. Nickless)
2. Orbitals in Sulfur and its Compounds (D. W. J. Cruickshank, B. C. Webster)
3. Stereochemistry of Group 16 Compounds (W. J. Geary)
4. Mechanisms of Sulfur Reactions (R. E. Davis)

5. Structural Studies on Sulfur Compounds (A. J. Banister, L. F. Moore, J. S. Padley)
6. Analytical Chemistry of Sulfur Compounds (E. Blasius, G. Horn, A. Knöchel, J. Münch, H. Wagner)
7. Elemental Sulfur (B. Meyer)
8. The (Biogeochemical) Sulfur Cycle (J. R. Postgate)
9. Chemistry of the Sulfur-Phosphorus Bond (D. E. Rogers, G. Nickless)
10. Sulfanes (W. C. Burton, P. Machmer)
11. Oxides of Sulfur (P. W. Schenk, R. Steudel)
12. Compounds Containing Sulfur-Halogen Bonds (H. L. Roberts)
13. The Nitrides, Nitride-Halides, Imides and Amids of Sulfur (H. G. Heal)
14. Lower Oxoacids of Sulfur (D. Lyons, G. Nickless)
15. Sulfuric Acid: Physico-Chemical Aspects of Manufacture (T. J. P. Pearce)
16. Sulfuric Acid as a Solvent System (R. J. Gillespie)
17. Fluorosulfuric Acid (R. C. Thompson)
18. Amido- and Imidosulfuric Acids (K. W. C. Burton, G. Nickless)
19. (Metal) Sulfides (F. Jellinek)

M. V. Ivanov, *Microbiological Processes in the Formation of Sulfur Deposits*, Jerusalem, **1968**.

A. V. Tobolsky (ed.), *The Chemistry of Sulfides*, Interscience, New York, **1968**.

J. A. Karchmer (ed.), *The Analytical Chemistry of Sulfur and its Compounds*, Part I, Wiley, New York, **1970**; with Chapters on following topics:

1. Elemental Sulfur
2. Total Sulfur
3. Sulfur-Containing Gases
4. Oxygen-Containing Inorganic Sulfur Compounds
5. Other Inorganic Sulfur Compounds (Sulfides, Polysulfides, Carbon Disulfide, Thiocarbonates, Thiocyanates, Sulfur Halides)
6. Thiols

A. Senning (ed.), *Sulfur in Organic and Inorganic Chemistry*, Vol. 1, Dekker, New York, **1971**, with Chapters on the following topics:

1. The Sulfur-Silicon Bond
2. The Sulfur-Nitrogen Bond
3. The Sulfur-Phosphorus Bond
4. The Sulfur-Oxygen Bond
5. The Sulfur-Sulfur Bond
6. The Sulfur-Fluorine Bond
7. The Sulfur-Chlorine Bond
8. The Sulfur-Bromine Bond
9. The Sulfur-Iodine Bond

A. Senning (ed.), *Sulfur in Organic and Inorganic Chemistry*, Vol. 2, Dekker, New York, **1972**, with Chapters on the following topics:

1. Chemistry of Atomic Sulfur
2. Diatomic Species Containing Sulfur
3. Bond Energy Terms in the Chemistry of sulfur, Selenium and Tellurium
4. Oxyacids of Sulfur
5. Pharmacology and Toxicology of Inorganic Sulfur Compounds
6. Mass Spectra of Sulfur Compounds
7. Mixed Sulfur Halides
8. Commercially Important Sulfur Compounds
9. Chromatographic Techniques in Sulfur Chemistry

A. Senning (ed.), *Sulfur in Organic and Inorganic Chemistry*, Vol. 3, Dekker, New York, **1972**, with Chapters on the following topics:

1. Reactions of Elemental Sulfur with Inorganic, Organic and Organometallic Compounds
2. Inorganic and Organic Polysulfides
3. Quantum Chemistry of Sulfur Compounds
4. Steric Aspects of Sulfur Chemistry
5. NMR Spectra of Sulfur Compounds
6. Labeled Sulfur Compounds
7. Thione-Enethiol Tautomerism
8. Nomenclature of Sulfur Compounds
9. Nucleophilicity of Organic Sulfur Compounds

J. A. Karchmer (ed.), *The Analytical Chemistry of Sulfur and its Compounds*, Part II, Wiley, New York, **1972**; with Chapters on the following topics:

1. Sulfides
2. Di- and Polysulfides
3. Thiophenes
4. Sulfur Analogs of Carbonyls, Carboxylic and Carbonic Acids
5. Tetra- and Hexavalent Organosulfur Compounds

D. J. Miller, T. K. Wiewiorowski (eds.), *Sulfur Research Trends*, Adv. Chem. Ser. 110, ACS, Washington, **1972**; with Chapters on the following topics:

1. Semiempirical MO Calculations on Sulfur-Containing Molecules
2. Electron Behavior in Some Sulfur Compounds
3. Spectra of Sulfur Allotropes
4. Transition Metal Complexes with Sulfur-Donor Ligands
5. Structures of Sulfur-Nitrogen Compounds
6. Influence of High Pressur on Elemental Sulfur
7. Reactions of Mercaptanes with Liquid Sulfur
8. Photolysis of Thiols
9. Addition of Sulfur Atoms to Olefins
10. Sulfur Chlorides and Organochlorides
11. Raman Spectra of Amorphous Chalcogenide Alloys
12. Fluorinated Sulfide Polymers
13. Electrical Conductivity of Liquid Sulfur and Sulfur-Phosphorus Mixtures
14. Chemical-Mechanical Alteration of Elemental Sulfur
15. Potential Applications of Sulfur

M. Schmidt, W. Siebert, in *Comprehensive Inorganic Chemistry*, Vol. 2, Chapter 23 (Sulfur), Pergamon, Oxford, **1973**, pp. 795-933 (579 references).

K. C. Mills, *Thermodynamic Data for Inorganic Sulfides, Selenides and Tellurides*, Butterworths, London, **1974**.

D. M. Greenberg (ed.), *Metabolic Pathways*, 3rd ed., Vol. VII: *Metabolism of Sulfur Compounds*, Academic Press, New York, **1975**.

R. Steudel, *Properties of Sulfur-Sulfur Bonds*, *Angew. Chem.* **1975**, *87*, 683; *Angew. Chem. Int. Ed. Engl.* **1975**, *14*, 655-664 (Review).

G. Brauer (ed.), *Handbuch der Präparativen Anorganischen Chemie*, Vol. 1, Enke, Stuttgart, **1975** (Preparation of basic inorganic sulfur compounds).

B. Meyer, *Sulfur, Energy, and Environment*, Elsevier, Amsterdam, **1977** (containing 1600 references with full titles). Chapters on the following topics:.

1. History of Sulfur
2. Properties of sulfur and Inorganic Sulfur Compounds
3. Analytical Chemistry of Sulfur Compounds
4. Occurrence and Sources of Sulfur
5. The Sulfur Cycles
6. Sulfur Production
7. Recovery of Sulfur from Combustion Gases
8. Environmental Control and Legislation
9. Medical Use and Health Effects
10. Sulfur in Agriculture and Food
11. Industrial Uses of Sulfur and Its Compounds
12. Sulfur Polymers
13. Sulfur Containing Materials
14. Future Trends

D. J. Bourne (ed.), *New Uses of Sulfur-II*, Adv. Chem. Ser. 165, ACS, Washington, **1978**.

H. G. Heal, *The Inorganic Heterocyclic Chemistry of Sulfur, Nitrogen and Phosphorus*, Academic Press, London, **1980**.

H. Bothe, A. Trebst (eds.), *Biology of Inorganic Nitrogen and Sulfur*, Springer, Berlin, **1981**.

A. Senning (ed.), *Sulfur in Organic and Inorganic Chemistry*, Vol.4, Dekker, New York, **1982**, with Chapters on the following topics:

1. The Sulfur-Silicon Bond (A. Hass, R. Hitze)
2. The Sulfur-Nitrogen Bond (H. W. Roesky)
3. The Sulfur-Phosphorus Bond (L. Almasi)
4. The Sulfur-Fluorine Bond (J. M. Shreeve)
5. The Sulfur-Chlorine Bond (W. R. Hardstaff, R. F. Langler)
6. The Sulfur-Bromine Bond (P. S. Magee)
7. The Sulfur-Iodine Bond (L. Field, C. M. Lukehart)

M. V. Ivanov, J. R. Freney (eds.), *The Global Biochemical Sulfur Cycle*, SCOPE 19, Wiley, New York, **1983**.

R. P. Tischer (ed.), *The Sulfur Electrode*, Academic Press, New York, **1983**.

R. Steudel, S. Paßlack-Stephan, G. Holdt, *Thermal Polymerization and Depolymerization Reactions of 10 Sulfur Allotropes Studied by HPLC and DSC*, *Z. Anorg. Allg. Chem.* **1984**, 517, 7- 42.

A. Müller, B. Krebs (eds.), *Sulfur - Its Significance for Chemistry, for the Geo-, Bio- and Cosmosphere and Technology*, Elsevier, Amsterdam, **1984**; with Chapters on the following topics:

1. Elemental Sulfur and Homocyclic Compounds and Ions (R. Steudel)
2. Sulfur in the Earth's Crust, Its Origin and Natural Cycle (K. H. Wedepohl)
3. Role of Sulfur in Black Powder (F. Seel)
4. Lapislazuli and Ultramarine Pigments (F. Seel)
5. New Developments in Organic Sulfur Chemistry (G. Kresze)
6. Organometallic Sulfur Compounds (H. Vahrenkamp)
7. Thiolates as Ligands in Transition Metal Complexes (J. R. Dilworth)
8. Metal Complexes of Sulfur and Sulfur-Nitrogen Compounds (H. W. Roesky)
9. Sulfido-Complexes of Molybdenum and Tungsten (A. G. Wedd)
10. Interaction of Metal Centers Through Sulfur-Containing Ligands (O. Kahn, J.-J. Girerd)

11. Electronic and Resonance Raman Spectra of Sulfur-Containing Complexes (R. J. H. Clark)
12. Technology of Sulfuric Acid (K. Brändle)
13. Flue Gas Desulfurization (M. Schmidt)
14. Metal Sulfides in Photovoltaic and Photoelectrochemical Energy Conversion (H. Tributsch)
15. Inorganic Chemistry of Rubber Vulcanization (J. A. McCleverty)
16. Biodegradation of Sulfur Minerals (K. Bosecker)
17. Microorganisms and the Sulfur Cycle (H. G. Trüper)
18. Phototrophic Bacteria and Their Sulfur Metabolism (H. G. Trüper)
19. Cytochromes and Iron Sulfur Proteins in Bacterial Sulfur Metabolism (U. Fischer)
20. Sulfur-Containing Ligands in Metalloproteins and Enzymes (W. E. Newton)
21. Genetic Diseases of Sulfur Metabolism in Humans (F. Skovby, S. H. Mudd)

F. Bernardi, I. G. Csizmadia, A. Mangini (eds.), *Organic Sulfur Chemistry: Theoretical and Experimental Advances*, Elsevier, Amsterdam, **1985**.

J. Sudworth, R. Tilley, *The Sodium-Sulfur Battery*, Chapman and Hall, London, **1985**.

Houben-Weyl, *Methoden der Organischen Chemie*, Volume on *Organische Schwefelverbindungen*, Thieme, Stuttgart, **1985** (1700 pages).

I. Hargittai, *The Structure of Volatile Sulfur Compounds*, Reidel Publ., Dordrecht, **1985** (molecular structures determined by electron diffraction and microwave spectroscopy).

R. J. Huxtable, *Biochemistry of Sulfur*, Plenum, New York, **1986**.

W. B. Jakoby, O. W. Griffith (eds.), *Methods in Enzymology*, Vol. 143: *Sulfur and Sulfur Amino Acids*, Academic Press, Orlando, **1987**.

M. G. Voronkov, N. S. Vyazankin, E. N. Deryagina, A. S. Nakhmanovich, V. A. Usov, *Reactions of Sulfur with Organic Compounds*, Plenum Press, New York, **1987**; with Chapters on the following topics:

1. Structure and Physical Properties of Elemental Sulfur

2. Preparation and Chemical Properties of Sulfur Allotropes
3. Action of Sulfur on Hydrocarbons
4. Reactions with Organic Halides
5. Reactions with Organic Sulfur Compounds
6. Reactions with Oxygen-Containing Compounds
7. Reactions with Nitrogen-Containing Compounds
8. Reactions with Organometallic Compounds

B. Zwanenburg, A. J. H. Klunder (eds.), *Perspectives in the Organic Chemistry of Sulfur*, Elsevier, Amsterdam, **1987**.

J. A. Cole, S. J. Ferguson (eds.), *The Nitrogen and Sulfur Cycles*, Cambridge Univ. Press, Cambridge, **1988**.

R. T. Oakley, *Sulfur-Nitrogen Heterocycles*, *Progr. Inorg. Chem.* **1988**, 36, 299-391.

P. Brimblecombe, A. Yu. Lein (eds.), *Evolution of the Biochemical Sulfur Cycle*, SCOPE 39, Wiley, New York, **1989**.

E. S. Saltzman, W. J. Cooper (eds.), *Biogenic Sulfur in the Environment*, ACS Symp. Ser. 393, ACS, Washington DC, **1989**.

W. L. Orr, C. M. White, *Geochemistry of Sulfur in Fossil Fuels*, A.C.S. Symp. Ser., Vol. 429, American Chemical Society, Washington, **1990**.

T. Koh, *Analytical Chemistry of Polythionates and Thiosulfate* (Review), *Analyt. Sci.* **1990**, 6, 3-14.

C. Chatgililoglu, K.-D. Asmus (eds.), *Sulfur-Centered Reactive Intermediates in Chemistry and Biology*, Plenum Press, New York, **1990**; *inter alia* with Chapters on the following topics:

1. Force Field and Molecular Orbital Calculations in Organosulfur Chemistry
2. Electronic Transitions in Sulfur-Centered Radicals
3. Electronic Properties of Sulfur-Containing Substituents and Molecules

4. Reactivity of Sulfur-Centered Nucleophiles
5. Alkenethiylperoxyl Radicals
6. Thermochemistry of Sulfur-Centered Intermediates
7. Single Electron Transfer in Nucleophilic Substitution
8. Electrochemical Reduction of Sulfur Compounds
9. Pulse Radiolysis
10. ESR Spectroscopy of Sulfur-Centered Radicals
11. Three-Electron Bonded Radicals
12. Radical Cations
13. Reaction Kinetics of Sulfur-Centered Biological Radicals
14. Redox Systems with Sulfur-Centered Species
15. Repair in Radiation Biology
16. Actions of the Glutathion/Disulfide System

S. Oae, *Organic Sulfur Chemistry: Structure and Mechanism*, CRC Press, Boca Raton, **1991**.

H. R. Krouse, V. A. Grinenko (eds.), *Stable Isotopes: Natural and Anthropogenic Sulfur in the Environment*, SCOPE 43, Wiley, New York, **1991**.

R. W. Howarth, J. W. B. Stewart, M. V. Ivanov (Eds.), *Sulfur Cycling on the Continents*, SCOPE 48, Wiley, New York, **1991**.

G. S. Tyndall, A. R. Ravishankara, *Atmospheric Oxidation of Reduced Sulfur Species*, *Int. J. Chem. Kin.* **1991**, 23, 483-527.

S. Oae, T. Okuyama (eds.), *Organic Sulfur Chemistry: Biochemical Aspects*, CRC Press, Boca Raton, **1992**.

W. Pasiuk-Bronikowska, J. Ziajka, T. Bronikowski, *Autoxidation of Sulphur Compounds*, Ellis Horwood, New York, **1992**.

R. B. King (ed.), *Encyclopedia of Inorganic Chemistry*, Vol. 7, Wiley, Chichester, **1994**; *inter alia* with Chapters on the following topics:

1. Inorganic Sulfur Chemistry (D. Woollins)

2. Sulfur-Nitrogen Compounds (T. Chivers)
3. Organic Polysulfanes (R. Steudel, M. Kustos)
4. S-Donor Ligands (M. Schröder)

Ullmann's Encyclopedia of Industrial Chemistry, Vol. A25, VCH, Weinheim, **1994**.

C. N. Alpers, D. W. Blowes (eds.), *Environmental Geochemistry of Sulfide Oxidation*, A.C.S. Symp. Ser., Vol 550, American Chemical Society, Washington D.C., **1994**.

Holleman-Wiberg: *Lehrbuch der Anorganischen Chemie*, 101. Auflage, W. de Gruyter, Berlin, **1995** (textbook with 75 pages on sulfur chemistry).

M. A. Vairaramurthy, M. A. A. Schoonen (eds.), *Geochemical Transformations of Sedimentary Sulfur*, ACS Symp. Ser. 612, Washington, **1995**.

L. L. Barton (ed.), *Sulfate-Reducing Bacteria*, Plenum Press, New York, **1995**.

E. I. Stiefel, K. Matsumoto (eds.), *Transition Metal Sulfur Chemistry*, A.C.S. Symp. Ser., Vol. 653, American Chemical Society, Washington D.C., **1996**.

N. N. Greenwood, A. Earnshaw, *Chemistry of the Elements*, 2nd ed., Butterworth, Oxford, **1997** (textbook with 101 pages on sulfur chemistry).

R. Steudel, *Chemie der Nichtmetalle (mit Atombau, Molekülgeometrie und Bindungstheorie)*, 2nd edition, de Gruyter, Berlin, **1998** (with 60 pages on sulfur chemistry).

A. Piéplu, O. Saur, J.-C. Lavalley, O. Legendre, C. Nédez, *Claus Catalysis and H₂S Selective Oxidation* (Review), *Catal. Rev. – Sci. Eng.* **1998**, *40*, 409-450.

Z. B. Alfassi (ed.), *S-Centered Radicals*, Wiley, Chichester, **1999**.

R. Steudel, A. Albertsen, *The Chemistry of Aqueous Sulfur Sols*, in A. Steinbüchel (ed.), *Biochemical Principles and Mechanisms of Biosynthesis and Biodegradation of Polymers*, Wiley-VCH, Weinheim, 1999, p. 17–26.

J. S. Kargel, P. Delmelle, D. B. Nash, *Volcanogenic Sulfur on Earth and Io: Composition and Spectroscopy*, *Icarus* **1999**, *142*, 249-280.

T. Kabe, A. Ishiara, W. Qian (eds.), *Hydrodesulfurization and Hydrodenitrogenation*, Wiley-VCH, Weinheim, **1999**.

P. N. L. Lens, L. Hulshoff Pol (eds.), *Environmental Technologies to Treat Sulfur Pollution: Principles and Engineering*, IWA Publishing, London, **2000**; with Chapters on the following topics:

1. The Chemical Sulfur Cycle (R. Steudel)
2. The Geochemical Sulfur Cycle (J. J. Middleburg)
3. The Biological Sulfur Cycle (T. Brüser, P. N. L. Lens, H. G. Trüper)
4. Removal of Sulfur from Diesel Oil (H. R. Reinhoudt)
5. Bioleaching of Sulfide Minerals (M. Boon)
6. Sulfur Transformation during Sewage Transport (T. Hvitvedt-Jacobsen, P. H. Nielsen)
7. Biological Treatment of Organic Sulfate-Rich Wastewaters (P. N. L. Lens, F. Omil, J. M. Lema, L. W. Hulshoff Pol)
8. Biological Removal of Sulfurous Compounds from Wastewaters (B. Johnson)
9. Anaerobic Treatment of Sulfate-Rich Wastewaters (J.-P. Steyer, N. Bernet, P. N. L. Lens, R. Moletta)
10. Survey of H₂S and SO₂ Removal Processes (J. A. Lagas)
11. Novel Biological Processes for the Removal of H₂S and SO₂ (A. J. H. Janssen, H. Dijkman, G. Janssen)
12. Biological Treatment of Gases Polluted by Volatile Sulfur Compounds (V. Herrygers, H. Van Langenhove, E. Smet)
13. Methods of Odor Measurement and Assessment (R. H. Fenner, R. M. Stuetz)
14. Treatment of Solid Materials Containing Inorganic Sulfur Compounds (R. Tichý)
15. Agricultural Aspects of Sulfur (W. H. O. Ernst)
16. Biodegradation of Sulfonated Aromatic Compounds (N. C. G. Tan, J. A. Field)
17. Metal Effects on Sulfur Cycle Bacteria and Metal Removal by Sulfate Reducing Bacteria (O. J. Hao)
18. Interactions of the Sulfur and Nitrogen Cycles: Microbiology and Process Technology (P. M. Chazal, P. N. L. Lens)

19. Sulfur-Storing Bacteria and Bulking of Activated Sludge ((D. H. Eikelboom)
20. Sulfur Problems in Anaerobic Digestion (V. O'Flaherty, E. Colleran)
21. Corrosion and Sulfur Bacteria (B. J. Little, R. I. Ray, R. K. Pope)
22. Recent Developments in Research on Biogenic sulfuric Acid Attack of Concrete (E. Vincke, J. Monteney, A. Beeldens, N. De Belie, L. Taerve, D. Van Gemert, W. H. Verstraete)

Holleman-Wiberg: *Inorganic Chemistry*, Academic Press, New York, **2001** (most comprehensive inorganic chemistry textbook).

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I. Solid Sulfur Allotropes (R. Steudel, B. Eckert)

1. Introduction
2. Allotropes at Ambient Pressure
3. High-Pressure Allotropes

II. Liquid Sulfur (R. Steudel)

1. Introduction
2. Historical Review
3. Recent Results

III. Speciation and Thermodynamics of Sulfur Vapor (R. Steudel, Y. Steudel,

M. W. Wong)

1. Introduction
2. Sulfur Vapor

IV. Homoatomic Sulfur Cations (I. Crossing)

1. Introduction
2. Synthesis of Sulfur Cations in Condensed Phases
3. Solid State Structures of Sulfur Cations
4. Gaseous Sulfur Cations
5. Thermodynamics of Sulfur Cations
6. Bonding

V. Aqueous Sulfur Sols (colloidal sulfur solutions) (R. Steudel)

1. Hydrophobic Sulfur Sols
2. Hydrophilic Sulfur Sols
3. Sulfur sols by Oxidation of Hydrogensulfide
4. Sulfur Sols Produced by Bacteria

VI. Biologically Produced Sulfur (W. E. Kleinjahn, A. de Keizer, A. J. H. Janssen)

1. Introduction
2. Colloidal Stability of Sulfur Particles
3. Properties of Biologically Produced Sulfur
3. Sulfur Compound Oxidizing Bacteria in Industrial Applications
4. Applications of Biologically Produced Sulfur

VII. Index

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I. Quantum Chemical Calculations of Sulfur-Rich Compounds (M. W. Wong)

1. Introduction
2. Computational Methods
3. Disulfane H_2S_2 and its Derivatives
4. Polysulfanes H_2S_n
5. Sulfur Clusters S_n
6. Cluster Anions $\text{S}_n^{\cdot-}$ and S_n^{2-}
7. Cluster cations $\text{S}_n^{\cdot+}$ and S_n^{2+}
8. Protonated sulfur clusters HS_n^+
9. Three-Electron S–S Bonds

II. Molecular Spectra of Sulfur Molecules and Solid Sulfur Allotropes (B. Eckert,

R. Steudel)

1. UV-Vis Spectra
2. Vibrational Spectra
3. Mass Spectra
4. XANES Spectra

III. Inorganic Polysulfanes H_2S_n (R. Steudel)

1. Preparation
2. Properties
3. Molecular Structures
4. Molecular Spectra
5. Reactions
6. Applications

IV. Inorganic Polysulfides S_n^{2-} and Radical Anions $S_n^{\bullet-}$ (R. Steudel)

1. Preparation of solid Polysulfides
2. Properties of solid Alkali Polysulfides
3. Structures of Polysulfide Dianions
4. Polysulfide Solutions
5. Vibrational Spectra
6. Reactions in Solution
7. Polysulfide Radical Anions

V. Polysulfido Complexes of Main Group and Transition Metals (N. Takeda, N. Tokitoh, R. Okazaki)

1. Synthesis
2. Structural Properties
3. Reactions

VI. Sulfur-Rich Oxides S_nO and S_nO_2 (R. Steudel)

1. Introduction
2. Preparation and Properties
3. Bond Properties

VII. Index

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N. Takeda, N. Tokitoh, R. Okazaki: *Compounds Between Si, Ge and Sn and Chalcogens*

T. Chivers, R. S. Laitinen: *Chalcogen-Nitrogen Chemistry*

R. Davies: *Chalcogen-Phosphorus Chemistry*

M. S. Wickleder: *Chalcogen-Oxygen Chemistry*

I. Krossing: *Structure and Bonding of the Neutral Chalcogens and their Polyatomic Cations*

W. S. Sheldrick: *Polychalcogenides*

Z. Xu: *Recent Developments in Binary Halogen-Chalcogen Compounds, Polyaniions and Polycations*

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