

The Gmelin Handbook of Inorganic Chemistry (Handbuch der Anorganischen Chemie), or simply “Gmelin,” is a multi-volume collection of data and information on inorganic and organometallic compounds.

Gmelin ceased publication in 1997.

The 8th Edition of the **Gmelin Handbook of Inorganic and Organometallic Chemistry** is the most extensive printed compilation of information and data on chemical elements and their compounds and alloys.

All information in the Handbook was derived from the primary journal and patent literature of **chemistry, physics, and metallurgy**, and then critically appraised and organized by chemical element and species.

Although Gmelin was published over many decades, the volumes are not uniform in their currency. Some elements are represented only by slim summary volumes published in the 1930s, with no further updates. Other elements (such as Fe, B, S, F, U, etc.) have numerous supplements.

In most cases, later supplement volumes focus on an element's organometallic compounds (Organische Verbindungen). Each volume indicates a literature coverage date on the back of the title page.

Gmelin is typically used to locate factual information on specific compounds via the Formula Indexes.

This information includes any or all of the following for a chemical compound:

- History and occurrence

- Formation and Preparation (Bildung und Darstellung)

- Physical properties (crystallographic, optical, spectral, electrical, magnetic, mechanical, thermodynamic)

- Chemical properties and reactions, electrochemical behavior, etc.

- Uses, toxicology, miscellany

Text is augmented by tables and graphs in many places. **All information is accompanied by the source literature reference.**

Since 1971, organometallics are heavily covered, except for compounds with Li, Na, K, Rb, Cs, Mg, Ca, Sr, & Ba central atoms. Those exceptions are covered in Beilstein CrossFire. Included in Gmelin are compounds with metal-carbon bonds except carbides, cyanides, cyanates, and thiocyanate.

From 1979 onwards, production of Gmelin has been geared to a gradual changeover from German to English. Volumes published after about 1982 are in entirely in English. Though volumes prior to 1982 are in German, **English table of contents and section headings in the page margins are provided for all but the very oldest volumes.** Patrons willing to take on the challenges of using German language source are rewarded by the superb and comprehensive content of this resource.

Gmelin contains such information as :

Physical properties

Analytical & Colloid chemistry

Ore dressing

Geochemistry

Metallography / Metallurgy / Mineralogy

Atomic physics

Electrochemistry

Crystallography

Corrosion and passivity

Toxicity

How is Gmelin Organized?

Gmelin is divided into 71 sets of volumes, each covering an element or, for minor elements, a group of elements e.g. rare earths. Each set has one or more main volumes and usually a number of supplemental volumes covering new information.

Each element (or group of elements) is assigned a unique System Number which has no relationship to its atomic number.

The numbering sequence starts with rare gases and progresses to the heavier metals. The system numbers are assigned so that the elements which commonly form cations have a higher system number than those which commonly form anions.

One way to find the system number for an element, consult the periodic table on the inside cover of any of the Formula Indexes.

Obviously, all compounds contain 2 or more elements. **Each compound is published in the set for the element with the highest system number.** For example, UOCl_2 is published in the Uranium volume, since the system number for U is 55, for O is 3, and for Cl is 6.

System NO.	Symbol	Element
1		Noble gases
2	H	Hydrogen
3	O	Oxygen
4	N	Nitrogen
5	F	Fluorine
6	Cl	Chlorine
7	Br	Bromine
8	I	Iodine
	At	Astatine
9	S	Sulfur
10	Se	Selenium
11	Te	Tellurium
12	Po	Polonium
13	B	Boron
14	C	Carbon
15	Si	Silicon
16	P	Phosphorus
17	As	Arsenic
18	Sb	Antimony
19	Bi	Bismuth
20	Li	Lithium
21	Na	Sodium
22	K	Potassium
23	NH ₄	Ammonium
24	Rb	Rubidium
25	Cs	Cesium
	Fr	Francium
26	Be	Beryllium
27	Mg	Magnesium
28	Ca	Calcium
29	Sr	Strontium
30	Ba	Barium
31	Ra	Radium
32	Zn	Zinc
33	Cd	Cadmium
34	Hg	Mercury

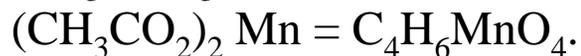
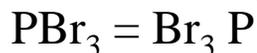
System No.	Symbol	Element
35	Al	Aluminum
36	Ga	Gallium
37	In	Indium
38	Tl	Thallium
39		Rare earths
40	Ac	Actinium
41	Ti	Titanium
42	Zr	Zirconium
43	Hf	Hafnium
44	Th	Thorium
45	Ge	Germanium
46	Sn	Tin
47	Pb	Lead
48	V	Vanadium
49	Nb	Niobium
50	Ta	Tantalum
51	Pa	Protactinium
52	Cr	Chromium
53	Mo	Molybdenum
54	W	Tungsten
55	U	Uranium
56	Mn	Manganese
57	Ni	Nickel
58	Co	Cobalt
59	Fe	Iron
60	Cu	Copper
61	Ag	Silver
62	Au	Gold
63	Ru	Ruthenium
64	Rh	Rhodium
65	Pd	Palladium
66	Os	Osmium
67	Ir	Iridium
68	Pt	Platinum
69	Tc	Technetium ¹⁾
70	Re	Rhenium
71		Transuranium

Indexes

The **Gmelin Formula Indexes** (GFI) were published in four sequential sets covering the Handbook through 1995. To be sure you're not missing an entry, all four sets must be checked in turn.

The indexes list in alphanumeric order all elements and defined compounds included in the Handbook. **The Gmelin empirical formula indexes are in strict alphabetic order by element symbol**, not in the more familiar Hill Order found in organic formula indexes, or in typical cation-anion order of common inorganics.

Thus, CuSO_4 would be found in the index as $\text{Cu O}_4 \text{ S}$. Other examples:

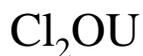


The index entry provides the conventional formula, element designation, volume, part, and page numbers where that compound can be found.

Example: Look up the compound UCl_2O

The formula index reads:

Column 1



^

*|Hill Convention
mol. formula*

Column 2



^

*Linear (classic)
molecular formula*

Column 3

U: Vol.A5-224

^

|

|

Uranium Supple. Vol. A5, page 224

Silver - Ag

Main Volume

Part A: History. Occurrence. The Element

Section 1: History. Occurrence

History. Cosmochemistry. Geochemistry: crystallochemical fundamentals, geochemical character and abundance, silver in the lithosphere, hydrosphere, and atmosphere. Minerals. A chapter on production statistics and the most important deposits completes this volume. -

Literature closing date: end of 1968.

1970. XI, 144 pages (in German). Cloth

ISBN 3-540-93202-X

Part B: The Compounds

Section 1: Compounds with Noble Gases, H, O, N, F, and Cl

Chapters on adsorption, solution, and diffusion of noble gases onto, into, and through silver; oxides and double oxides with alkali and alkaline earth metals; nitride, azide, amide, nitrite, and nitrate; binary compounds and complexes, and systems and compounds of the silver halide with alkali and alkaline earth salts; silver salts of chlorine oxoacids such as chlorate or perchlorate. - Literature closing date: end of 1969.

1971. 154 figs. XXXI, 542 pages (in German).

ISBN 3-540-93206-2

Section 2: Compounds with Bromine, Iodine, and Astatine

Includes the following topics: AgBr; complexes; systems of AgBr with other silver salts and with alkali and alkaline earth salts; and silver salts of bromooxoacids. A similar chapter on silver and iodine completes the coverage of the silver halides. Photochemical decomposition, especially in connection with the photographic process, is also discussed. - Literature closing date: mid-1970.

1972. 118 figs. XXVI, 481 pages (in German). Cloth

ISBN 3-540-93207-0

Section 3: Compounds with S, Se, Te, Po, B, C, and Si

The virtually insoluble black chalcogenides Ag_2S , Ag_2Se , and Ag_2Te - which occur in many modifications - are emphasized. The sulfate, thiosulfate, carbonate, cyanide, and thiocyanate are also covered. - Literature closing date: end of 1971. 1973. 149 figs. XXVIII, 389 pages (in German). Cloth

ISBN 3-540-93208-9

Section 4: Compounds with P, As, Sb, Bi, and the Metals

Salts of the various phosphorus acids. Also many ternary sulfides, selenides, and tellurides, such as AgGaS_2 and AgGaSe_2 , whose electrical and optical properties have been studied in detail. - Literature closing date: end of 1972.

1974. 155 figs. XL, 493 pages (in German). Cloth

ISBN 3-540-93209-7

Section 2: The Element (Technology and Preparation. Isotopes. The Atom. Molecules. Physical Properties of the Metal)

Preparation by pyrometallurgical and wet metallurgical methods, by the amalgam process, recovery of crude silver from anode muds, purification, and secondary recovery. Preparation, separation, enrichment, and properties of the isotopes. - Literature closing date: 1968. 1970. 76 figs. XXII, 350 pages (in German). Cloth

ISBN 3-540-93203-8

Section 3: The Element (Chemical Reactions. Detection and Determination. Toxicity. Colloidal Silver)

Chemical reactions of the metal and of the Ag^I and Ag^{II} ions. Detection and determination, including detection and determination of the isotopes. Also discusses colloidal silver. - Literature closing date: end of 1969. 1971. 14 figs. XVIII, 224 pages (in German). Cloth

ISBN 3-540-93204-6

Section 4: The Element (Electrochemical Behavior)

Chapters on standard potential, ionic mobility, $Ag|$ silver salt electrodes, polarography, and electrode reactions complete the four-volume treatment of elemental silver. - Literature closing date: end of 1969.

1973. 132 figs. XX, 394 pages (in German). Cloth

ISBN 3-540-93205-4

Section 5: Organosilver Compounds. Organosilver Salts

Covers the organosilver compounds. Subsections deal with σ -compounds (especially the alkyl and alkynyl compounds), carbonyl and isonitrile complexes, as well as π -complexes with unsaturated organic ligands (e.g., ethylene). The second main chapter covers the silver salts of organic acids (especially of formic, acetic, and oxalic acids). - Literature closing date: end of 1973. 1975. 44 figs. XIV, 187 pages (in German). Cloth

ISBN 3-540-93282-8

Section 6: Complex Compounds with Neutral and Inner-complex-forming Ligands: Silver(I) Complexes with N- and O-containing Ligands

The inorganic ligands (H_2O , NH_3 , N_2H_4 , and NH_2OH) are covered first, followed by organic ligands (amines, N-heterocycles, alcohols, aldehydes, ketones, ethers, O-heterocycles, aminoalcohols, aminoacids, amino-N-polycarboxylic acids, Schiff's bases, azo compounds, oximes, acid amides, and nitriles). - Literature closing date: mid-1974. 1975. 49 figs. XVI, 356 pages (in German).

ISBN 3-540-93306-9

Section 7: Complex Compounds with Neutral and Inner-complex-forming Ligands: Silver(I) Complexes with Ligands which Contain S, Se, Te, P, As, Sb, Bi, B, Si, or Ge; Silver(II) and Silver(III) Complexes. Subject and Ligand Index for Silver Part B Sections 1 to 7

Completes the Ag^I complexes. Also describes the Ag^{II} and Ag^{III} complexes, among which ligands containing N, as for instance N-heterocycles, are most important. The subject and ligand indexes at the end of the volume improve access to the material contained in volumes Ag B 1 to Ag B 7. - Literature closing date: mid-1974.

1976. 49 figs. XVI, 430 pages (in German). Cloth

1976. 49 figs. XVI, 430 pages (in German). Cloth

ISBN 3-540-93310-7

Gold - Au

Main Volume

Section 1: History

Covers history from classical antiquity, through the Middle Ages, to modern times. Also covers the practical uses of gold in historical times and delves into early conceptions about gold and its properties. - Literature closing date: end of 1949.

1950, reprint 1978. VIII, 100 pages (in German).

Cloth ISBN 3-540-93077-9

Section 2: Occurrence. Manufacture. Formation and Preparation in Pure State. Special Forms. Colloidal Gold. Surface Treatment

Occurrence covers cosmochemistry, geochemistry, deposits, and minerals. The discussion of manufacture includes ore dressing, recovery of gold both from nature and from industrial products, and gold refining. -

Literature closing date: end of 1949.

1954, reprint 1974. 20 figs. XVI, 306 pages (in German).

Cloth ISBN 3-540-93265-8

Section 3: Physical Properties. Electrochemical Behavior and Chemical Reactions. Detection and Determination. Gold Compounds. Gold Alloys

Has a general section on the reactions of gold salts. Compounds and alloys include all elements except the platinum-group elements, Tc, Re, and the transuranium elements, and alloys with rare earth elements and Ac. Alloys are indexed alphabetically. - Literature closing date: end of 1949.

1954, reprint 1979. 201 figs. XXXVIII, 558 pages (in German).

Cloth ISBN 3-540-93079-5

Section 4: Compounds with Metals (Gmelin System Numbers 26 to 61)

Covers the systems and compounds which contain gold, at least one metal element of the groups 1 to 6, 11 to 14 of the periodic system, or Mn, Fe, Co, Ni, as well as a nonmetal element.

Concludes the series on the purely inorganic gold compounds. -

Literature closing date: mid of 1995. 1996. 73 figs. XVI, 245

pages. Cloth ISBN 3-540-93739-0

Organogold Compounds

Organogold compounds have been applied to a variety of practical uses in integrated circuits, protective coatings, catalysts, and medicine. All gold compounds with at least one gold-carbon bond are described, except for the gold cyanides. Contains an empirical formula index and a ligand formula index. - Literature closing date: end of 1979. 1980. 55 figs. XIV, 351 pages. Cloth

Supplement Volume

Part B: Compounds

Section 1: Compounds with Noble Gases, H, O, N, F, and Cl.
Covers the interactions and compounds of gold with noble gases, hydrogen, oxygen, nitrogen, fluorine, and chlorine. The major portion deals with the halogen compounds and specifically with the chlorine containing compounds and ions: AuCl, AuCl₂⁻, AuCl₃, and above all AuCl₄⁻. Literature closing date: mid-1991. 1992. 35 figs. XVIII, 348 pages. Cloth

ISBN 3-540-93655-6

Section 2: Compounds with Br, I, the Chalcogens (S, Se, Te, Po), B, and C

Covers the binary systems of gold and Br, I, S, Se, Te, Po, C and treats the numerous gold compounds containing these and additional elements (H, O, N, F, Cl). - Literature closing date: end of 1992.

1994. 72 figs. XX, 367 pages. Cloth ISBN 3-540-93694-7

Section 3: Compounds with Si, P, As, Sb, Bi, the Alkali metals and Onium Cations

Covers the systems and compounds composed of gold, Si, P, As, Sb, or Bi and additional elements of Gmelin system nos. 1 to 19. Included are the compounds which in addition contain Li, Na, K, NH₄, Rb, or Cs. Concludes with the description of compounds composed of an inorganic aurate anion and an onium (ammonium, iminium, iodonium, sulfonium, carbenium, phosphonium, arsonium) cation. - Literature closing date: end of 1993. 1995. 95 figs. XXII, 400 pages. Cloth

ISBN 3-540-93719-6

alkyls, complexes of boric acid with polyalcohols (e.g., mannitol), and alkyl-boron-nitrogen compounds. - Literature closing date: end of 1949.

1954, reprint 1976. 28 figs. XX, 253 pages (in German).

Cloth

ISBN 3-540-93034-5

Supplement Volume 2: Elemental Boron. Boron Carbides

Preparation, structures, and properties of the numerous modifications of elemental boron. The B-C system, boron carbides, and the production and uses of "B₄C". - Literature closing date: mid-1980 for elemental B and the end of 1975 for systems and compounds with carbon. 1981. 89 figs. XVI, 242 pages. Cloth

ISBN 3-540-93448-0

I can't read the entry! It's in German.

Earlier volumes are in German with some English captions. More recent volumes, 1982+, are in English. Use a German-English science dictionary to translate unfamiliar words. All of the foreign language dictionaries are located in the the reference collection.

Patterson's German-English dictionary for chemists

Cassell's German - English, English - German dictionary

Dictionary of chemistry and chemical engineering