Magnetic Materials

An introductory overview of barrier materials, high κ dielectric materials, and atomic layer deposition (ALD) is provided in the Technical Appendix section.

Supercondctors

Superconductors are materials which exhibit no electrical resistance below a certain temperature defined as the critical temperature (T_c). Prior to 1986, the highest T_c reported was 20 K for Nb_3Ge and Nb_3Sn.[1] In 1986–87, however, a group lead by Johannes Bednorz and Karl Müller reported the ceramic oxides $YBa_2Cu_3O_7$ (Aldrich product **32,862-6**) and $La_{2-x}Ba_xCuO_{4-x}$ which superconduct above the boiling point of nitrogen (77K).[2,3] Materials whose T_cs are greater than the boiling point of nitrogen (a common, readily available cryogenic coolant) are referred to as high-temperature superconductors (HTS). For their work, Bednorz and Müller were awarded the Nobel Prize in Physics in 1987.[4]

Other more exotic compounds such as fullerides have also exhibited superconducting properties. Fullerides of the formula A_xC_{60} (A = K, Rb, Cs) are reported to have superconducting character.[5] Although superconductive compounds have been known for nearly a century, the relatively mundane compound magnesium boride has only recently been demonstrated to exhibit superconductivities. Magnesium boride, MgB_2 (Aldrich product **55,391-3**) is not only superconductive but its critical temperature is surprisingly high for a simple ceramic material (T_c = 39 K).[6] Figure 1 shows an image of a MgB_2 wire segment with a tungsten boride core. The wire is formed by reaction of magnesium vapor with a boron filament. The grain structure seen in this image is visible under polarized light.[7]

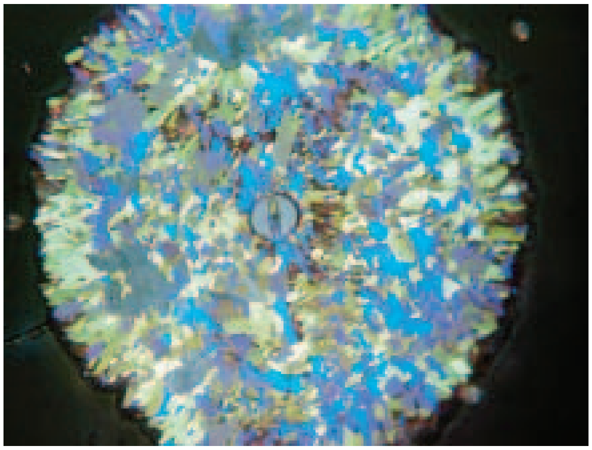


Figure 1. The cross section of a MgB_2 wire segment. (Image courtesy of D.K. Finnemore, S.L. Bud'ko, P.C. Canfield, Ames Laboratory, Iowa State University.)

Spintronics

Spintronics (short for spin-based electronics), sometimes called magnetoelectronics, is the term given to microelectronic devices that function by exploiting the spin of electrons. The most common use of spintronics today is in computer hard drives. Here memory storage is based on giant magnetoresistance (GMR), a spintronic effect. There is current research focussing on bringing magnetic random-access memory (MRAM) to market. Spintronic based MRAMs should rival the speed and rewritability of conventional RAM and retain their state (and thus memory) even when the power is turned off. Motorola has recently developed a 256-kb MRAM (see Figure 2) based on a single magnetic tunnel junction and a single transistor. This MRAM has read/write cycles of less than 50 nanoseconds.

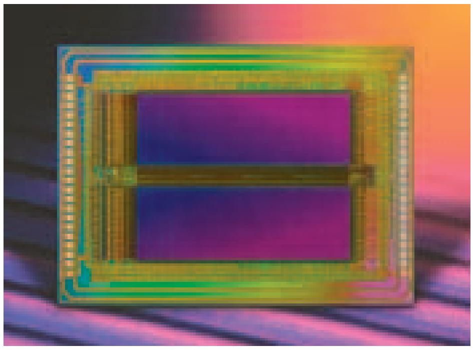


Figure 2. A 256-kb MRAM based on modern spintronics technology. (Image courtesy of Motorola Corp.)

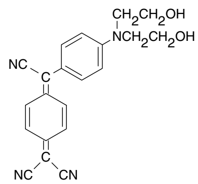
References (1) Gavaler, J.R. *App. Phys. Lett.* **1973**, *23*, 480. (2) Wu, M. K. et al. *Phys. Rev. Lett.* **1987**, *58*, 908. (3) Beno, M.A. et al. *Appl. Phys. Lett.* **1987**, *51*, 57. (4) http://www.nobel.se/ (5) Hebard, A.F. et al. *Nature* **1991**, *350*, 600. (6) Nagamatsu, J. et al. *Nature* **2001**, *410*, 63. (7) Canfield, P.C. et al. *Phys. Res. Lett.* **2001**, *86*, 1877.

Charge Transfer Complexes

Acceptors

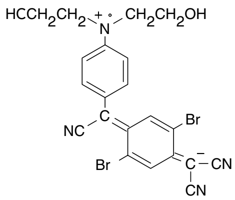
2-[4-((4-(Bis(2-hydroxyethyl)amino]phenyl)(cyano)methylene]-2,5-cyclohexadien-1-ylidene]malonitrile

57,210-1 CAS No. 287922-16-1 — 50 mg, 250 mg
$C_{21}H_{18}N_4O_2$ FW 358.4
98%
R: 20/21/22-36/37/38 S: 26-36



2-[4-((4-(Bis(2-hydroxyethyl)amino)phenyl)(cyano)methylene)-2,5-dibromo-cyanohexadien-1-ylidene]malonitrile

57,650-6 CAS No. 287922-14-9 — 5 mg, 25 mg
$C_{21}H_{16}Br_2N_4O_2$ FW 516.2
98%
R: 36/37/38 S: 26-36

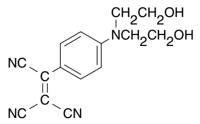


Charge Transfer Complexes

Acceptors

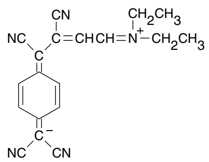
[4-[Bis(2-hydroxyethyl)amino]phenyl]-1,1,2-ethylenetricarbonitrile

57,212-8 CAS No. 56672-91-4 — 50 mg, 250 mg
$(HOCH_2CH_2)NC_6H_4C(CN)C(CN)_2$
FW 282.3
98%
solid
λ_{max} . . . . 514 nm
R: 36/37/38 S: 26-36



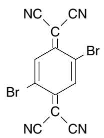
N-[3-Cyano-3-[4-(dicyanomethyl)phenyl]-2-propenylidene]-*N*-ethyl-ethaniminium inner salt

57,213-6 CAS No. 174280-29-6 — 50 mg, 250 mg
$C_{17}H_{16}N_4$ FW 276.3
λ_{max} . . . . 698 nm (lit.)
R: 36/37/38 S: 26-36



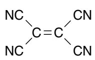
2,5-Dibromo-7,7,8,8-tetracyanoquinodimethane

57,209-8 CAS No. 56403-70-4 — 5 mg, 25 mg
$C_{12}H_2Br_2N_4$ FW 362.0
98%
R: 36/37/38 S: 26-36



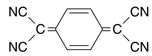
Tetracyanoethylene

T880-9 (Percyanoethylene; Ethylenetetracarbonitrile; TCNE) — 1 g, 5 g, 10 g, 25 g
CAS No. 670-54-2
$(NC)_2C:C(CN)_2$ FW 128.1
98%
mp . . . . 197-199 (lit.)
Licensed under U.S. Patent 3 166 584
R: 25 S: 36/37/39-45



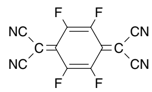
7,7,8,8-Tetracyanoquinodimethane

15,763-5 ((2,5-Cyclohexadiene-1,4-diylidene)-dimalononitrile; TCNQ) — 1 g, 5 g, 10 g
CAS No. 1518-16-7
$C_{12}H_4N_4$ FW 204.2
98%
Electron-acceptor molecule used to form charge-transfer superconductors. Williams, J.M. et al. *Organic Superconductors (Including Fullerenes): Synthesis, Structure, Properties, and Theory* Prentice-Hall: Englewood Cliffs, NJ, **1992** (Z24,430-9).
mp . . . . 287-289 °C (dec.) (lit.)
R: 22 S: 22-24/25



2,3,5,6-Tetrafluoro-7,7,8,8-tetracyanoquinodimethane

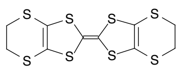
37,677-9 ((2,3,5,6-Tetrafluoro-2,5-cyclohexadiene-1,4-diylidene)dimalononitrile; 7,7,8,8-Tetracyano-2,3,5,6-tetrafluoroquinodimethane) — 5 mg, 25 mg
CAS No. 29261-33-4
$C_{12}F_4N_4$ FW 276.1
97%
mp . . . . 291 °C (dec.) (lit.)
S: 22-24/25



Donors

Bis(ethylenedithio)tetrathiafulvalene

36,202-6 (Bi[5,6-dihydro-1,3-dithiolo[4,5-b][1,4]-dithiine-2-ylidene]; BEDT-TTF) — 100 mg, 500 mg
CAS No. 66946-48-3
$C_{10}H_8S_8$ FW 384.7
98%
Used as a component for organic superconductors. *Aldrichimica Acta* **1990,** *23,* 54.
mp . . . . 244 °C (dec.) (lit.)
S: 22-24/25

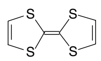


Charge Transfer Complexes

Donors

Tetrathiafulvalene

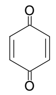
18,318-0 (TTF; Δ2,2′-Bi-1,3-dithiole) — 100 mg, 250 mg, 1 g
CAS No. 31366-25-3
$C_6H_4S_4$ FW 204.4
97%
Electron donor for supramolecular synthesis,[1] charge-transfer complex synthesis[2] with 7,7,8,8-tetracyanoquinodimethane (15,763-5), and for electron transfer to diazonium salts.[3] (1) *Chem. Soc. Rev.* **1994,** *23,* 41. (2) *Aldrichimica Acta* **1985,** *18,* 73. (3) *Tetrahedron Lett.* **1994,** *35,* 8675.
mp . . . . 120-123 °C (lit.)
R: 43 S: 36/37



Other Donors & Acceptors

p-Benzoquinone

B1,035-8 (Quinone) — 5 g, 100 g, 500 g, 1 kg
CAS No. 106-51-4
$C_6H_4O_2$ FW 108.1
98%
Free radical inhibitor
Vapor density. . . . . 3.73 (vs air)
Vapor pressure. . . . . 0.1 mm Hg (25 °C)
mp . . . . 113-115 °C (lit.)
R: 23/25-36/37/38-50 S: 26-28-45-61

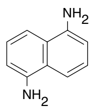


Chloranil

23280 CAS No. 118-75-2 — 10 g, 50 g, 250 g
$C_6Cl_4O_2$ FW 245.9
puriss., ≥99.0% (AT)
R: 36/38-50/53 S: 37-60-61

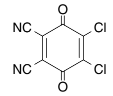
1,5-Diaminonaphthalene

D2,120-0 (1,5-Naphthalenediamine) — 25 g, 100 g
CAS No. 2243-62-1
$C_{10}H_{10}N_2$ FW 158.2
97%
mp . . . . 185-187 °C (lit.)
R: 40-50/53 S: 36/37-60-61



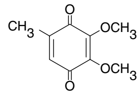
2,3-Dichloro-5,6-dicyano-*p*-benzoquinone

D6,040-0 (4,5-Dichloro-3,6-dioxo-1,4-cyclohexadiene-1,2-dicarbonitrile; DDQ) — 5 g, 10 g, 100 g
CAS No. 84-58-2
$C_8Cl_2N_2O_2$ FW 227.0
98%
mp . . . . 213-216 °C (lit.)
R: 25-29 S: 22-24/25-37-45



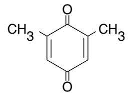
2,3-Dimethoxy-5-methyl-*p*-benzoquinone

29,956-1 (Coenzyme Q_0) — 1 g, 5 g
CAS No. 605-94-7
$C_9H_{10}O_4$ FW 182.2
99%
mp . . . . 59-60 °C (lit.)
R: 36/37/38 S: 26-36



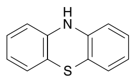
2,6-Dimethylbenzoquinone

D14,970-5 CAS No. 527-61-7 — 1 g, 5 g
$C_8H_8O_2$ FW 136.1
99%
mp . . . . 71-73 °C (lit.)



Phenothiazine

P1,483-1 CAS No. 92-84-2 — 25 g, 500 g, 1 kg
$C_{12}H_9NS$ FW 199.3
98+%
Employed in the preparation of carbazoles and piperazines,[1] and charge-transfer semiconducting complexes.[2] (1) *Indian J. Chem., Sect. B: Org. Chem. Incl. Med. Chem.* **1994,** *33B,* 397. (2) *Mol. Cryst. Liq. Cryst. Sci. Technol., Sect. A* **1993,** *237,* 419.
bp. . . . . 371 °C/760 mm Hg (lit.)
mp . . . . 182-187 °C (lit.)
R: 36/37/38-43 S: 26-36

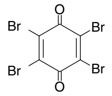


Charge Transfer Complexes

Other Donors & Acceptors

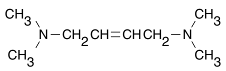
Tetrabromo-1,4-benzoquinone

34,350-1 CAS No. 488-48-2 — 5 g
$C_6Br_4O_2$ FW 423.7
90%, Technical Grade
mp . . . . 292-294 °C (lit.)
R: 36/37/38 S: 26-37/39



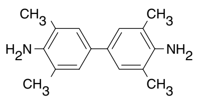
Tetrakis(dimethylamino)ethylene

23,423-0 (Octamethyl-ethylenetetramine) — 25 g
CAS No. 996-70-3
$C_{10}H_{24}N_4$ FW 200.3
95%
To prolong shelf-life, store under argon!
n_D^{20} . . . . 1.48 (lit.)
bp. . . . . 59 °C/0.9 mm Hg (lit.)
Fp. . . . . 128 °F
Density. . . . . 0.861 g/mL (lit.)
R: 10-34 S: 26-36/37/39-45



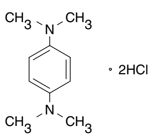
3,3′,5,5′-Tetramethylbenzidine

86,033-6 (TMB) — 100 mg, 1 g, 5 g, 25 g
CAS No. 54827-17-7
$C_{16}H_{20}N_2$ FW 240.3
99+%
mp . . . . 168-169 °C (lit.)
R: 36/37/38 S: 26-36



N,N,N′,N′-Tetramethyl-*p*-phenylenediamine dihydrochloride

23,469-9 (Wurster's Reagent dihydrochloride; Wurster's reagent) — 1 g, 5 g, 25 g
CAS No. 637-01-4
$C_{10}H_{16}N_2 \cdot 2HCl$ FW 237.2
98%
mp . . . . 222-224 °C (lit.)
R: 36/37/38 S: 26-36



Inorganic Magnetic Materials

Metals

Cerium

CAS No. 7440-45-1
Ce FW 140.1
R: 20/21/22-36/37/38 S: 16-26-36/37/39

46,121-0 **chips, 99.9%** — 10 g, 50 g
Packaged under argon
mp . . . . 795 °C (lit.)
Density. . . . . 6.67 g/mL (lit.)

26,104-1 **ingot, 99.9%** — 25 g, 100 g
Packaged under oil

26,300-1 **99.9%, powder, –40 mesh** — 10 g, 50 g
Packaged under oil and nitrogen

Iron

CAS No. 7439-89-6
Fe FW 55.85

31,035-2 **granules, low in magnesium and manganese, ACS reagent** — 100 g, 500 g
Mg. . . . . ≤5 ppm
Mn. . . . . ≤0.002%
R: 11 S: 16-33

46,037-0 **foil, thickness 0.127 mm, 99.5%** — 2.6 g, 10.4 g
R: 25-36 S: 26-36/37/39-45

Neodymium

46,087-7 CAS No. 7440-00-8 — 10 g, 50 g
Nd FW 144.2
powder, –40 mesh, 99+% (Purity based on trace metals analysis)
Packaged under argon in ampules
Density. . . . . 7.003 g/mL (lit.)
R: 11-36/37/38 S: 16-26-33-36/37/39

Nickel

CAS No. 7440-02-0
Ni FW 58.69

52,035-7 **flake, 20 μm** — 500 g
R: 10-17-36/37/38-40-42/43 S: 16-26-33-36

26,828-3 **powder, (submicron), 99.8%** — 25 g, 100 g
Average particle size determined by Fisher sub-sieve sizer
R: 10-17-36/37/38-40-42/43 S: 16-26-33-36

26,698-1 **powder, 3 μm, 99.7%** — 100 g, 500 g
Average particle size determined by Fisher sub-sieve sizer
Density. . . . . 8.9 g/mL (lit.)
R: 10-17-36/37/38-40-42/43 S: 16-26-33-36

26,697-3 **powder, –100 mesh, 99%** — 100 g, 500 g
R: 10-17-36/37/38-40-42/43 S: 16-26-33-36

26,824-0 **wire, diam. 0.5 mm, 99+%** — 35 g, 175 g
175 g of 100 m
35 g of 20 m
R: 40-43 S: 22-36

Inorganic Magnetic Materials

Oxides

Ferric hydroxide oxide

(Goethite)
CAS No. 20344-49-4
Fe(OH)O FW 88.85

54,626-7 **crystalline powder** 50 g, 250 g

37,125-4 **catalyst grade, 30-50 mesh** 50 g, 250 g

Iron(II,III) oxide

CAS No. 1317-61-9
Fe_3O_4 FW 231.5
R: 20/21/22-36/37/38 S: 26-36/37/39-45

51,815-8 **99.99%** 10 g, 50 g

31,006-9 **powder, 5 µm, 98%** 25 g, 500 g, 2.5 kg

Iron(II) oxide

40,086-6 CAS No. 1345-25-1 — 5 g, 25 g
FeO FW 71.84
-10 mesh, 99.9%
Employed in the synthesis of the first example of a mixed-valence ammonium iron phosphate, $NH_4Fe_2(PO_4)_2$. Boudin, S. Lii, K-H. *Inorg. Chem.* **1998,** *37,* 799.
Density. . . . . 5.7 g/mL (lit.)
R: 11 S: 16-33-7/9

Iron(III) oxide

(Ferric oxide)
CAS No. 1309-37-1
Fe_2O_3 FW 159.7
Density. . . . . 5.24 g/mL (lit.)
R: 36/37/38 S: 36/37/39

52,931-1 **99.999%** 5 g, 25 g
Fp. . . . . >230 °F

25,572-6 **99.998%** 10 g, 50 g

20,351-3 **99.98%** 10 g, 50 g

31,005-0 **powder, 5 µm, 99+%** 25 g, 500 g, 2.5 kg

48,066-5 **99.9%** 10 g, 50 g

34,300-5 **pieces, 3-12 mm, 99.8%** 50 g
Suitable for vacuum deposition.
sintered

Neodymium oxide

CAS No. 1313-97-9
Nd_2O_3 FW 336.5
Density. . . . . 7.24 g/mL (lit.)

20,385-8 **99.99%** 10 g, 50 g

22,865-6 **99.9%** 25 g, 100 g

Salts

Erbium(III) bromide hydrate

57,522-4 CAS No. 29843-93-4 — 5 g, 25 g
$ErBr_3 \cdot xH_2O$ FW 407.0
99.999%
bp. . . . . 1460 °C mm Hg
mp . . . . . 923 °C
R: 36/37/38 S: 26-36

Iron(II) titanate

40,087-4 CAS No. 12022-71-8 — 25 g, 100 g
FeO_3Ti FW 151.7
–100 mesh
R: 20/21/22-36/37/38-40 S: 22-26-36

Neodymium bromide hydrate

54,505-8 CAS No. 29843-90-1 — 10 g, 50 g
$Br_3Nd \cdot xH_2O$ FW 384.0
solid
Density. . . . . 5.3 g/mL (lit.)
R: 36/37/38 S: 26-36

Neodymium chloride hexahydrate

CAS No. 13477-89-9
$NdCl_3 \cdot 6H_2O$ FW 358.7

20,383-1 **99.99%** 20 g, 100 g
mp . . . . . 124 °C (lit.)
R: 36/37/38 S: 26-37/39

28,918-3 **99.9%** 25 g, 100 g
R: 36/37/38 S: 26-36

Neodymium(III) phosphate hydrate

58,709-5 CAS No. 14298-32-9 — 5 g
NdO_4P FW 239.2
99.99+%
R: 36/37/38 S: 26-36

Neodymium(III) titanate

40,369-5 $Nd_4O_{16}Ti_5$ FW 1072 — 100 g, 500 g
–325 mesh

Potassium hexacyanocobaltate(III)

21,864-2 (Tripotassium hexacyanocobaltate(III)) — 5 g, 100 g, 500 g
CAS No. 13963-58-1
$K_3Co(CN)_6$ FW 332.3
Applied in formation of a xerogel via a cyanogel the gel has potential use in solid-state gas sensors. Sharp, S.L. et al. *Chem. Mater.* **1998,** *10,* 880.
Density. . . . . 1.878 g/mL (lit.)
R: 23/24/25 S: 28-36/37-45-7/9

Potassium hexacyanoferrate(III)

(Potassium ferricyanide; Red prussiate)
CAS No. 13746-66-2
$K_3Fe(CN)_6$ FW 329.2
R: 32-36/37/38 S: 26-36

45,594-6 **≥99.99%** 25 g, 100 g
Density. . . . . 1.89 g/mL (lit.)

Inorganic Magnetic Materials

Salts

39,351-7 **99+%, ACS reagent, powder, 10 µm** — 5 g, 100 g, 500 g
ferro compounds. . . . . ≤0.05%
insolubles. . . . . ≤0.005%
Cl^-. . . . . ≤0.01%
SO_4^{2-}. . . . . ≤0.01%

24,402-3 **≥99.0%** — 5 g, 100 g, 500 g
ACS reagent
insolubles. . . . . ≤0.005%
Density. . . . . 1.89 g/mL (lit.)

20,801-9 **99%** — 500 g, 2 kg
Density. . . . . 1.85 g/mL (lit.)

Potassium hexacyanoruthenate(II)

37,823-2 CAS No. 314075-44-0 — 500 mg, 2.5 g
$C_6H_6K_4N_6ORu$ FW 435.6
R: 23/24/25-36/37/38 S: 22-26-36/37/39-45

Sodium nitroferricyanide(III)

43,145-1 (Sodium pentacyanonitrosylferrate; Nitroprusside sodium; sodium nitroprusside; SNP) — 10 g, 50 g
CAS No. 13755-38-9
$Na_2[Fe(CN)_5NO] \cdot 2H_2O$ FW 297.9
99.99+%, *ReagentPlus*™
Meets A.C.S. reagent specifications.
insolubles. . . . . ≤0.01%
total metallic impurities. <100 ppm
Density. . . . . 1.72 g/mL (lit.)
Cl^-. . . . . ≤0.02%
SO_4^{2-}. . . . . Passes test
™Trademark of Sigma-Aldrich Co.
R: 25-32 S: 22-37-45

Magnetic Nanostructures See: Books *Page* 497

Superconductor Precursors

Lanthanides

Erbium(III) chloride hexahydrate

CAS No. 10025-75-9
$Cl_3Er \cdot 6H_2O$ FW 381.7
R: 36/37/38 S: 26-37/39

20,321-1 **99.995%** — 20 g, 100 g

28,925-6 **99.9%** — 25 g, 100 g

Erbium(III) nitrate pentahydrate

CAS No. 10031-51-3
$ErN_3O_9 \cdot 5H_2O$ FW 443.4
R: 8-37/38-41 S: 17-26-36/39

54,510-4 **99.9999%** — 10 g, 50 g

29,816-6 **99.9%** — 25 g, 100 g

Erbium oxide

CAS No. 12061-16-4
Er_2O_3 FW 382.5
R: 36/37/38 S: 26-36

20,323-8 **99.99+%** — 5 g, 25 g
Density. . . . . 8.64 g/mL (lit.)

28,924-8 **99.9%** — 5 g, 25 g, 100 g

Lanthanide oxides See: Metallic Oxides *Page* 453

Lanthanum oxide

20,355-6 CAS No. 1312-81-8 — 20 g, 100 g, 500 g
La_2O_3 FW 325.8
99.999%
Precursor to LAMOX fast ion conductors and superconductors.
Density. . . . . 6.51 g/mL (lit.)
R: 36/37/38 S: 26-36

Samarium oxide

CAS No. 12060-58-1
Sm_2O_3 FW 348.8
R: 33 S: 22-24/25

39,439-4 **99.999%** — 5 g, 25 g
Radioactive for shipping purposes

22,867-2 **99.9%** — 10 g, 100 g
Density. . . . . 8.347 g/mL (lit.)

Ytterbium(III) bromide hydrate

54,496-5 CAS No. 15163-03-8 — 5 g, 25 g
$YbCl_3 \cdot xH_2O$ FW 279.4
mp . . . . 300 °C (lit.)

Yttrium See: Metals *Page* 346

Yttrium barium copper oxide

32,862-6 CAS No. 107539-20-8 — 10 g, 50 g
$YBa_2Cu_3O_x$, x ~ 6.7
powder
R: 20/21/22-36/37/38 S: 22-26-28-36

Yttrium chloride hexahydrate

CAS No. 10025-94-2
$YCl_3 \cdot 6H_2O$ FW 303.4
R: 36/37/38 S: 26-36

20,491-9 **99.999%** — 10 g, 50 g
Density. . . . . 2.18 g/mL (lit.)

46,431-7 **99.99%** — 25 g, 100 g
mp . . . . 100 °C (dec.) (lit.)

21,164-8 **99.9%** — 50 g, 250 g

Yttrium hexaboride

33,326-3 CAS No. 12008-32-1 — 2 g
YB_6 FW 153.8
powder, −100 mesh

Superconductor Precursors

Lanthanides

Yttrium(III) oxide

CAS No. 1314-36-9
Y_2O_3
Density. . . . . 5.01 g/mL (lit.)
R: 36/37/38 S: 26-36

20,492-7	**99.999%**	2 g 10 g 50 g
20,516-8	**99.99%**	10 g 50 g 250 g

Other Metal Compounds

Barium calcium tungsten oxide See: Metallic Oxides *Page* 454

Barium strontium tungsten oxide See: Metallic Oxides *Page* 454

Bismuth strontium calcium copper oxide See: Metallic Oxides *Page* 454

Lithium hydride

20,104-9 CAS No. 7580-67-8 — 5 g, 100 g, 500 g
LiH FW 7.949
powder, −30 mesh, 95%
mp . . . . 680 °C (lit.)
Density. . . . . 0.82 g/mL (lit.)
R: 14-34 S: 16-26-27-36/37/39

Magnesium boride

55,391-3 CAS No. 12007-25-9 — 5 g, 25 g
MgB_2 FW 45.93
Superconduction material with unique properties.
References
Nature **418**, 760 (2002)
S: 22-24/25

Molybdenum(VI) oxide

(Molybdenum trioxide)
CAS No. 1313-27-5
MoO_3 FW 143.9
Precursor to LAMOX fast ion conductors and superconductors.[1,2]
mp . . . . .795 °C (lit.)
Density. . . . . 4.692 g/mL (lit.)
References
1. Lacorre, P., *Nature* **404**, 856 (2000)
2. Arulraj, A., *Chem. Mater.* **14**, 2492 (2002)
R: 36/37-48/20/22 S: 22-23

20,381-5 **99.99%** — 5 g, 25 g
Used in the solid state synthesis of a remarkable ternary, reduced molybdenum oxide, $Pr_4Mo_9O_{18}$, whose structure contains previously unknown Mo_7, Mo_{13}, and Mo_{19} clusters. The new cluster product is a small band gap semiconductor. Tortelier, J. Gougeon, P. *Inorg. Chem.* **1998,** *37,* 6229.

26,785-6 **99.5+%, ACS reagent** — 100 g, 500 g
insol. dil. NH_4OH. . . . .≤0.01%
AsO_4^{3-}, PO_4^{3-} and SiO_2. . . . . ≤0.001%
Cl^-. . . . . ≤0.002%
NO_3^-. . . . . Passes test
PO_4^{3-}. . . . . ≤5 ppm
SO_4^{2-}. . . . . ≤0.02%
Heavy metals. . . . . ≤0.005%
NH_4^+. . . . . ≤0.002%

22,181-3 **10-20 µm, 99+%** — 100 g, 500 g

Potassium hydride

21,581-3 CAS No. 7693-26-7 — 75 g, 300 g
KH FW 40.11
30 wt % dispersion in mineral oil
R: 11-14/15-34 S: 16-26-27-36/37/39-45

Potassium tetrachloropalladate(II)

20,579-6 (Potassium palladium(II) chloride) — 2 g, 10 g
CAS No. 10025-98-6
K_2PdCl_4 FW 326.4
Used in the synthesis of semiconducting metal-containing polymers in which the polypyrrole backbone has a conformational energy minimum and is nearly planar. Reacts with bis(dithiolates) to metal-bis(dithiolates) with applications in laser Q-switch materials, optical CD recording media, bar code material and superconductivity.
mp . . . . 105 °C (dec.) (lit.)
Density. . . . . 2.67 g/mL (lit.)
References
1. Mathis, M. et al., *Chem. Mater.* **10**, 3568 (1998)
2. Cummings, S.D.; Eisenberg, R., *Inorg. Chim. Acta* 225 (1996)
R: 36/37/38 S: 26-36

Potassium tetrachloroplatinate(II)

(Potassium platinum(II) chloride)
CAS No. 10025-99-7
K_2PtCl_4 FW 415.1
Reacts with bis(dithiolates) to form metal-bis(dithiolates) with applications in laser Q-switch materials, liquid crystals, optical CD recording media, bar code materials and superconductivity. Reacts with capping polymers to form shape-control colloidal platinum nanoparticles for catalysis and photocatalysts.,
References
1. Ahmedi, T.S., *Science* **272**, 1924 (1996)
2. Ahmedi, T.S., *Chem. Mater.* **8**, 1162 (1996)
3. Cummings, S.D.; Eisenberg, R., *Inorg. Chem.* 225 (1996)
R: 25-34-42/43 S: 22-26-36/37/39-45

32,341-1	**99.99%**	250 mg 1 g 5 g
52,085-3	**Engelhard code S3020** Pt ≥46.2%	1 g 5 g 25 g

Sodium hydride

22,344-1 CAS No. 7646-69-7 — 50 g, 250 g, 1 kg
NaH FW 24.00
dry, 95%
Direct intercalation into C_{60} results in the superconducting material $(NaH)_4C_{60}$.
mp . . . . 800 °C (dec.) (lit.)
References
Imaeda, K. et al., *Solid State Commun.* **99**, 479 (1996)
R: 15 S: 24/25-43-7/8

For anhydrous metal halides See: Anhydrous Halides *Page* 255

For Molecular Based Superconductors see Charge Transfer Complexes Section See: Charge Transfer Complexes *Page* 182