

Examples of Potentially Unstable Compounds

Note: This list is not exhaustive

Chemical	Type
1,1-Dichloroethylene (vinylidene chloride)	Peroxide-forming
2-Butenal (crotonaldehyde)	Peroxide-forming ¹
2-Furaldehyde	Pyrophoric ¹
2-propenal (acrylaldehyde)	Peroxide-forming ¹
9,10-Dihydroanthracene	Peroxide-forming ²
Acetal (acetaldehyde diethyl acetal)	Peroxide-forming
Acetaldehyde	Peroxide-forming ¹
Acetaldehyde diethyl acetal (acetal)	Peroxide-forming
Acetyl chloride	Water-reactive ¹
Acetylenic compounds [especially polyacetylenes, haloacetylenes, and heavy metal salts of acetylenes (copper, silver, and mercury salts are particularly sensitive)]	Shock-sensitive
Acrylaldehyde (2-propenal)	Peroxide-forming ¹
Acrylic acid	Peroxide-forming
Acrylonitrile	Peroxide-forming
Acyl nitrates	Shock-sensitive
Alkali metal amides	Water-reactive
Alkali metal hydrides	Water-reactive
Alkali metals	Water-reactive
Alkali metals [such as Na, K]	Pyrophoric
Alkyl aluminum [R ₃ Al]	Pyrophoric
Alkyl and acyl nitrites	Shock-sensitive
Alkyl arsenic [R ₃ As]	Pyrophoric
Alkyl boron [R ₃ B]	Pyrophoric
Alkyl lithium [RLi]	Pyrophoric
Alkyl nitrates [particularly polyol nitrates such as nitrocellulose and nitroglycerine]	Shock-sensitive
Alkyl perchlorates	Shock-sensitive
Alkyl phosphorus [R ₃ P]	Pyrophoric
Alkyl sodium [RNa]	Pyrophoric
Alkyl zinc [R ₂ Zn]	Pyrophoric
Aluminum alkyls	Water-reactive
Aluminum chloride [AlCl ₃]	Water-reactive
Aluminum powder	Pyrophoric
Amminemetal oxosalts [metal compounds with coordinated ammonia, hydrazine, or similar nitrogenous donors and ionic perchlorate, nitrate, permanganate, or other oxidizing group]	Shock-sensitive
Anhydrous metal halides [such as AlCl ₃ , TiCl ₄ , ZrCl ₄ , SnCl ₄]	Water-reactive
Arsine [AsH ₃]	Pyrophoric
Azides [including metal, nonmetal, and organic azides]	Shock-sensitive
Boron	Pyrophoric ¹
Boron trichloride [BCl ₃]	Water-reactive
Boron trifluoride [BF ₃]	Water-reactive
Butadiene	Peroxide-forming
Butadiene (diacetylene)	Peroxide-forming
Cadmium (finely-divided)	Pyrophoric ¹
Calcium (finely-divided)	Pyrophoric ¹
Calcium carbide	Water-reactive
Calcium oxide	Water-reactive ¹

Chemical	Type
Cellosolves (ethylene glycol monoethers)	Peroxide-forming
Chlorite salts of metals [such as AgClO ₂ and Hg(ClO ₂) ₂]	Shock-sensitive
Chlorobutadiene (chloroprene)	Peroxide-forming
Chloroprene (chlorobutadiene)	Peroxide-forming
Chlorosulfonic Acid	Water-reactive ¹
Chlorotrifluoroethylene	Peroxide-forming ²
Chromium (finely-divided)	Pyrophoric ¹
Cobalt powder	Pyrophoric
Crotonaldehyde (2-butenal)	Peroxide-forming ¹
Cumene (isopropylbenzene)	Peroxide-forming
Cyanamide [CH ₂ N ₂]	Shock-sensitive
Cyclohexene	Peroxide-forming
Cyclooctene	Peroxide-forming
Cyclopentene	Peroxide-forming
Decahydronaphthalene (decalin)	Peroxide-forming
Decalin (decahydronaphthalene)	Peroxide-forming
Diacetylene (butadiene)	Peroxide-forming
Diazo compounds [such as CH ₂ N ₂]	Shock-sensitive
Diazonium salts, when dry	Shock-sensitive
Dibenzocyclopentadiene	Peroxide-forming ²
Diborane [B ₂ H ₆]	Pyrophoric
Dichloroborane	Pyrophoric ¹
Dicobalt octacarbonyl [Co ₂ (CO) ₈]	Pyrophoric
Dicyclopentadiene	Peroxide-forming
Diethyl ether (ether)	Peroxide-forming
Diethylene glycol dimethyl ether (diglyme)	Peroxide-forming
Diglyme (diethylene glycol dimethyl ether)	Peroxide-forming
Diisopropyl ether (isopropyl ether)	Peroxide-forming
Dinitroacetonitrile	Shock-sensitive
Dioxane (<i>p</i> -dioxane)	Peroxide-forming
Disulfur dichloride [S ₂ Cl ₂]	Water-reactive
Divinyl acetylene (DVA)	Peroxide-forming
Divinyl ether	Peroxide-forming
Ether (diethyl ether)	Peroxide-forming
Ethylene glycol dimethyl ether (glyme)	Peroxide-forming
Ethylene glycol ether acetates	Peroxide-forming
Ethylene glycol monoethers (cellosolves)	Peroxide-forming
Ferrous sulfide	Water-reactive ¹
Fulminates [silver fulminate, AgCNO, can form in the reaction mixture from the Tollens' test for aldehydes if it is allowed to stand for some time; this can be prevented by adding dilute nitric acid to the test mixture as soon as the test has been completed]	Shock-sensitive
Furan	Peroxide-forming
Glyme (ethylene glycol dimethyl ether)	Peroxide-forming
Grignard reagents [RMgX]	Pyrophoric/Water-reactive
Halides of nonmetals [such as BCl ₃ , BF ₃ , PCl ₃ , PCl ₅ , SiCl ₄ , S ₂ Cl ₂]	Water-reactive
Hydrogen peroxide at concentrations above 30% [when it becomes increasingly treacherous as the concentration rises, forming explosive mixtures with organic materials and decomposing violently in the presence of traces of transition metals]	Shock-sensitive
Indene	Peroxide-forming ²
Inorganic acid halides [such as POCl ₃ , SOCl ₂ , SO ₂ Cl ₂]	Water-reactive

Chemical	Type
Iron pentacarbonyl [Fe(CO) ₅]	Pyrophoric
Iron powder	Pyrophoric
Isopropyl ether (diisopropyl ether)	Peroxide-forming
Isopropylbenzene (cumene)	Peroxide-forming
Lead (finely-divided)	Pyrophoric ¹
Lithium	Water-reactive ¹
Lithium alkyls	Water-reactive
Lithium aluminum hydride [LiAlH ₄]	Pyrophoric
Magnesium	Water-reactive ¹
Magnesium powder	Pyrophoric
Maleic anhydride	Water-reactive ¹
Manganese powder	Pyrophoric
Mercury chlorite [Hg(ClO ₂) ₂]	Shock-sensitive
Metal alkyls [such as lithium alkyls and aluminum alkyls]	Water-reactive
Metal alkyls and aryls [such as RLi, RNa, R ₃ Al, R ₂ Zn]	Pyrophoric
Metal carbonyls [such as Ni(CO) ₄ , Fe(CO) ₅ , Co ₂ (CO) ₈]	Pyrophoric
Metal hydrides [such as NaH, LiAlH ₄]	Pyrophoric
Metal powders [such as Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr]	Pyrophoric
Methyl acetylene	Peroxide-forming
Methyl cyclopentane	Peroxide-forming
Methyl isobutyl ketone	Peroxide-forming
Methyl methacrylate	Peroxide-forming
<i>N</i> -Halogen compounds [such as difluoroamino compounds and halogen azides]	Shock-sensitive
Nickel (finely-divided)	Pyrophoric ¹
Nickel tetracarbonyl [Ni(CO) ₄]	Pyrophoric
Nitric amide	Shock-sensitive
Nitrocellulose	Shock-sensitive
Nitroglycerine	Shock-sensitive
Nitroguanidine	Shock-sensitive
Nitrourea	Shock-sensitive
<i>N</i> -Nitro compounds [such as <i>N</i> -nitromethylamine, nitrourea, nitroguanidine, and nitric amide]	Shock-sensitive
<i>N</i> -nitromethylamine	Shock-sensitive
Nonmetal alkyls [such as R ₃ B, R ₃ P, R ₃ As]	Pyrophoric
Nonmetal hydrides [such as diborane, B ₂ H ₆ , and other boranes, PH ₃ , AsH ₃]	Pyrophoric
Organic acid halides and anhydrides of low molecular weight	Water-reactive
Oxo salts of nitrogenous bases [perchlorates, dichromates, nitrates, iodates, chlorites, chlorates, and permanganates of ammonia, amines, hydroxylamine, guanidine, etc.]	Shock-sensitive
Palladium powder	Pyrophoric
<i>p</i> -Dioxane (dioxane)	Peroxide-forming
Perchlorate salts [most metal, nonmetal, and amine perchlorates can be detonated and may undergo violent reaction in contact with combustible materials]	Shock-sensitive
Peroxides (solid) [that crystallize from or are left from evaporation of peroxidizable solvents]	Shock-sensitive
Peroxides and hydroperoxides, organic	Shock-sensitive
Peroxides, transition-metal salts	Shock-sensitive
Phosphine [PH ₃]	Pyrophoric
Phosphoric trichloride [POCl ₃]	Water-reactive
Phosphorus (white)	Pyrophoric
Phosphorus (yellow)	Pyrophoric ¹
Phosphorus pentachloride [PCl ₅]	Water-reactive

Chemical	Type
Phosphorus Pentasulfide	Water-reactive ¹
Phosphorus pentoxide	Water-reactive
Phosphorus trichloride [PCl ₃]	Water-reactive
Picrates [especially salts of transition and heavy metals, such as Ni, Pb, Hg, Cu, and Zn; picric acid is explosive but is less sensitive to shock or friction than its metal salts and is relatively safe as a water-wet paste]	Shock-sensitive
Platinum powder	Pyrophoric
Polynitroalkyl compounds [such as tetranitromethane and dinitroacetonitrile]	Shock-sensitive
Polynitroaromatic compounds [especially polynitro hydrocarbons, phenols, and amines]	Shock-sensitive
Potassium amide	Peroxide-forming
Potassium metal	Peroxide-forming / Pyrophoric / Water-reactive ¹
Silicon tetrachloride [SiCl ₄]	Water-reactive
Silver chlorite [AgClO ₂]	Shock-sensitive
Silver fulminate [AgCNO]	Shock-sensitive
Sodamide (sodium amide)	Peroxide-forming
Sodium amide (sodamide)	Peroxide-forming
Sodium hydride [NaH]	Pyrophoric
Sodium metal	Water-reactive ¹ / Pyrophoric
Stannic chloride [SnCl ₄]	Water-reactive
Styrene	Peroxide-forming
Sulfuryl chloride [SO ₂ Cl ₂]	Water-reactive
t-Butyl alcohol	Peroxide-forming ²
Tetrafluoroethylene (TFE)	Peroxide-forming
Tetrahydrofuran (THF)	Peroxide-forming
Tetrahydronaphthalene (tetralin)	Peroxide-forming
Tetralin (tetrahydronaphthalene)	Peroxide-forming
Tetranitromethane	Shock-sensitive
Thionyl chloride [SOCl ₂]	Water-reactive
Tin powder	Pyrophoric
Titanium powder	Pyrophoric
Titanium tetrachloride [TiCl ₄]	Water-reactive
Vinyl acetate	Peroxide-forming
Vinyl acetylene (MVA)	Peroxide-forming
Vinyl chloride	Peroxide-forming
Vinyl ethers	Peroxide-forming
Vinyl pyridine	Peroxide-forming
Vinylidene chloride (1,1-dichloroethylene)	Peroxide-forming
Zinc powder	Pyrophoric
Zirconium powder	Pyrophoric
Zirconium tetrachloride [ZrCl ₄]	Water-reactive

Sources

Main: National Research Council, Committee on Hazardous Substances in the Laboratory, *Prudent Practices for Disposal of Chemicals from Laboratories*, National Academy Press, Washington, D.C., 1983.

Additional: ¹ Boston Fire Department, Fire Prevention Division, *Storage Practice for Hazardous Materials*, Issued by Fire Captain Thomas C. Scavitto, Special Hazards Officer, Boston, MA

² National Safety Council, *Recognition and Handling of Peroxidizable Compounds*, Data Sheet I-655 Rev. 87, Chicago, IL