



Appendix C

List of Pyrophoric Materials

see examples at:

http://www.chemistry.ucla.edu/file-torage/publicview/pdfs/Pyrophoric_Chemicals.pdf

Bretherick's Handbook of Reactive Chemical Hazards

Phase: solid, liquid or gas

Liquids: "examples

Alkylaluminum reagents (Neat or in hydrocarbon solvents) (Neat reagents are VERY pyrophoric)

Alkyllithium reagents (Typically in hydrocarbon solvents) (Tert-butyllithium is VERY pyrophoric)

Alkenyllithium and Aryllithium reagents (Typically in hydrocarbon solvents)

Alkynyllithium reagents (Typically in hydrocarbon solvents)

Alkylzinc reagents (Neat reagents are pyrophoric)

Boranes (Neat reagents are pyrophoric)

Grignard Reagents (RMgX) (Typically in hydrocarbon solvents)

Partially or fully alkylated derivatives of metal and nonmetal hydrides (diethylaluminium

hydride, diisobutylaluminium hydride, dichloro(methyl)silane) (Usually in liquid form or in solution.)

Alkylated metals (butyllithium, triethylboron, trimethylaluminum) (Usually in liquid form or in solution.)

Non-metal alkyls: R_3B , R_3P , R_3As ; Tetramethylsilane, Tributylphosphine"

Metal alkyls and aryls, such as RLi , RNa , R_3Al , R_2Zn

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Solids:

Alkali metals (lithium, sodium, potassium, especially sodium potassium alloy – NaK , and even more dangerous are cesium and rubidium)

Alkylated metal alkoxides or halides (dimethylaluminum chloride, diethylethoxyaluminium)

Finely divided metals (bismuth, calcium, hafnium, iron, magnesium, titanium, uranium, zirconium) Al, Co, Fe, Mg, Mn, Pd, Pt, Ti, Sn, Zn, Zr

Low valent metals (titanium dichloride)

Metal hydrides (potassium hydride, sodium hydride, lithium aluminum hydride, uranium trihydride NaH , LiAlH_4)

Nonmetals (white phosphorous)

Metal carbonyls (dicobalt octacarbonyl, nickel carbonyl) $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Co}_2(\text{CO})_8$

Used hydrogenation catalysts, e.g. Raney Ni, are especially hazardous due to adsorbed hydrogen gas

Copper fuel cell catalysts, e.g. $\text{Cu}/\text{ZnO}/\text{Al}_2\text{O}_3$ Methanetellurool (CH_3TeH)

Finely divided Iron sulfides (FeS , FeS_2 , Fe_3S_4), Potassium sulfide (K_2S), Aluminum phosphide (AlP)" UCLA

Gases:

Nonmetal hydrides (arsine, boranes, germane, phosphine, silane) (Most of these are actually gases.)

B_2H_6 and other boranes, PH_3 , AsH_3



Index to Pyrophoric Chemicals

acetic acid bromide	benzyl sodium	cacodyl iodide
acetic acid chloride	beryllium	cacodyl sulfide
acetyl bromide	beryllium borohydride	cadmium
acetyl chloride	beryllium hydride	cadmium amide
acetyl peroxide	bis(ethylamino) siloxene	cadmium nitride
aluminum	bis-cyclopentadienyl	calcium
aluminum	manganese	calcium carbide
aminoborohydride	bis-dimethylstibine oxide	calcium hydride
aluminum borohydride	bismuth	calcium hypochlorite
aluminum borohydride	bismuth ethyl chloride	calcium nitride
aluminum borohydride	bis-trifluoromethyl	calcium phosphide
mixture	chlorophosphine	calcium sulfide
aluminum hydride	bis-trifluoromethyl	carbon disulfide
aluminum phosphide	cyanophosphine	carbon hexachloride
aluminum sesquibromide	bis-trifluoromethyl	carbon trichloride
ethylate	phosphine	cerium
amyl trichlorosilane	boron	cerium aluminohydride
anisic acid chloride	boron arsenotribromide	cerium amalgam
anisoyl chloride	boron chloride tetramer	cerium hydride
antimony pentachloride	boron tribromide	cerium hydride amalgam
antimony triethyl	boron triethyl	cerium nitride
antimony trimethyl	boron trimethyl	cerium-indium alloys
arsenic trichloride	bromine pentafluoride	cesium
arsenic triethyl	bromoacetylene	cesium amide
arsenic trimethyl	bromoethyne	cesium arsenic alloy
azido thallium	bromosilane	cesium bismuth alloy
barium	butadiene	cesium hydride
barium azide	butyl boron dichloride	cesium oxide
barium carbide	butyl boron difluoride	cesium phosphide
barium hydride	butyl lithium	cesium silicide
barium peroxide	cacodyl	cesium-antimony alloy
barium sulfide	cacodyl arsine	charcoal
benzene, 1,2-epoxyethyl	cacodyl chloride	chlorine trifluoride
benzoyl chloride	cacodyl dioxide	chloroacetylene
benzyl silane	cacodyl fluoride	chlorodimethyl arsine



chloroethyne	diethyldiethyl amino-3-	divanadium
chlorosulfonic acid	propyl alumine	dodecacarbonyl
chromium	diethyl 4-	divinyl zinc
chromium-cobalt alloy	ethoxybutylamine	ethanoyl bromide
chromium monoxide	diethyl phosphine	ethanoyl chloride
chromyl chloride	1,2-diethyl tetraiodo	ethylaluminum dichloride
cobalt	dialumene	ethyl aluminum
cobalt abietate	diethyl zinc	sesquichloride
cobalt amalgam	difluorourea	ethyl boron dichloride
cobalt nitride	digermane	ethyl dichloroalumine
cobaltous resinate	dihydrohexaborane	2-ethylhexaldehyde
cobalt triphosphine	diisobutyl aluminum	ethyl lithium
copper	chloride	ethyl methyl arsine
copper aluminohydride	diisobutyl aluminum	ethyl nitrite
copper hydride	hydride	ethyl pentaborane
cupric phosphide	diisopropylberyllium	ethyl sodium
decaborane	dimethyl allyl arsine	ethyl trichlorosilane
deuterium	dimethyl arsine	eupropium
diacetylene	dimethyl beryllium	ferrous oxide
diamidophosphorous acid	dimethyl cadmium	gallium hydride
diazirine	dimethylchloroarsine	germanium hydride
diborane	dimethyl dichlorosilane	germanium tetrahydride
dibromo borine phosphine	dimethyl dimethyl	hafnium
dibutyl boron chloride	phosphoramidate	hafnium borohydride
dibutyl chloroborine	dimethyl magnesium	HEF-2
dibutyl magnesium	dimethyl manganese	hexaamminecalcium
di-chloroacetylene	dimethyl phosphine	hexaborane
diethoxy siloxene	di- n -propyl zinc	hexachloroethane mixture
diethyl aluminum bromide	di- n -propylaluminum	hydrogen phosphide
diethyl aluminum chloride	hydride	indium monoxide
diethyl aluminum hydride	diphosphine	iron
diethyl arsine	dipotassium aci -	iron amalgam
diethyl beryllium	nitroacetate	iron hydroxide
diethyl bismuth chloride	dipropyl chloroborine	iron pentacarbonyl
diethyl boron chloride	disilane	iron sulfide
diethyl cadmium	disilyamino diborane	isobutyl titanium
diethyl dichlorosilane	disilyamino dichloroborine	trichloride
	disulfur dinitride	isopropylaluminum



lanthanum-antimony alloy	methylene magnesium	phenyldimethyl antimony
lead	methylethyliodoarsine	phenyl lithium
lead imide	methyl lithium	phenyloxiran
lithium	methyl phosphine	phenylsilver
lithium aluminum	methyl sodium	phosphine
deuteride	methyl trichlorosilane	phosphorus
lithium aluminum hydride	(methyl sily)amino	phosphorus oxychloride
lithium aluminum tri- tert -	diborane	phosphorus pentachloride
butoxyhydride	molybdenum	phosphorus pentasulfide
lithium amide	molybdenum dioxide	phosphorus sesquisulfide
lithium borohydride	molybdenum trioxide	phosphorus trichloride
lithium dimethylamide	monochlorodiborane	phosphorus trioxide
lithium hydride	monomethylhydrazine	plutonium
lithium hypochlorite	nickel	plutonium hydride
lithium phosphide	nickel carbonyl	potassium
lithium phosphorus alloy	nickel-iron alloy	potassium-antimony alloy
lithium silicide	nickel lanthanum	potassium arsenic alloy
lithium tetramethyl borate	nitrosilane	potassium carbide
magnesium	nitroso chloride of α -	potassium carbonyl
magnesium cyanide	methylstyrene	potassium chlorate
magnesium diamide	p -nitrosophenol	potassium graphite
magnesium diethyl	O,O-dimethyl	potassium hydride
magnesium diphenyl	thiophosphoryl chloride	potassium nitride
magnesium hydride	oleum	potassium nitromethane
magnesium phosphide	oxodisilane	potassium peroxide
manganese	oxosilane	potassium phosphide
manganese	pentaborane	potassium-phosphorus
aluminohydride	pentamethyl aluminum	alloy
manganese heptoxide	hydride	potassium silicide
manganese-bismuth alloy	pentamethyl dialumene	potassium sulfide
methyl aluminum	perchloroethane	n -propyl lithium
sesquibromide	phenyl cacodyl	propyl silane
methyl aluminum	phenyl	prosiloxane
sesquichloride	cyclotetramethylene borine	3-pyridine-diazonium
N-methyl N,N-	phenyldiazosulfide	fluoroborate
bis(diethylborinic)imide	phenyl	pyridinium perchlorate
methyl copper	dicyclopentadienylvanadiu	rosin
methylene dilithium	m	rubidium



rubidium-antimony alloy	strontium	titanium trichloride
rubidium-arsenic alloy	strontium azide	triazido borine
rubidium-bismuth alloy	strontium hydride	tribromo borine arsine
rubidium hydride	styrene oxide	tribromosilane
rubidium phosphide	sulfur	tributyl phosphine
rubidium silicide	sulfur trioxide	tri-chloroacetylene
silane	sulfuryl chloride	trichlorosilane
silicocyn	tetraborane	trichlorotrimethylborazole
silicon	tetrabromosilane	tridecanal
silicon carbide	tetrabutyl diborinyl	tridecyl aldehyde
silicon hexachloride	oxyethane	triethyl alumine diethyl
silicon hydride	tetrachlorodiborane	ether
silicon monoxide	1,1,2,2-tetramethyl	triethyl aluminum
siloxane	dialumene	triethyl aluminum etherate
silver	tetramethyl diarsine	triethyl aluminum triethyl
silyl phosphine	tetramethyl diborane	boron
sodium	tetramethyl diborane	triethyl antimony sulfate
sodium acetate	tetramethyl digalline	triethyl bismuth
sodium aluminum hydride	tetramethyl distibine	triethyl borine
sodium amalgam	tetramethyl silane	triethyl diborane
sodium amide	tetramethyldiarsyl	1,1,3-triethyl ethoxy
sodium carbide	tetraphenyl diarsine	diphosphinyl oxide
sodium carbonyl	thiophosphoryl fluoride	triethyl gallium
sodium hydrazide	thorium	triethyl indium
sodium hydride	thorium hydride	triethyl stibine
sodium hydrosulfite	thorium nitride	triethyl tellurium
sodium hydroxylamine	thorium oxysulfide	1,1,1-triethyl
sodium hypochlorite	thorium silver alloy	trichlorodialumene
sodium lead alloy	tin	trifluoromethyl phosphine
sodium methylate	tin tetrachloride	trigermane
sodium nitromethane	titanium boride	tri-iso-butylaluminum
sodium phosphamide	titanium carbide	trimethyl alumine dimethyl
sodium phosphide	titanium dibromide	ether
sodium silicide	titanium dichloride	trimethyl alumine diethyl
sodium sulfide	titanium diiodide	ether
sodium-potassium alloy	titanium monoxide	trimethyl aluminum
stannic phosphide	titanium tetrachloride	trimethyl aluminum
stearic acid		bromide



trimethyl aluminum
dimethyl ether complex
trimethyl aluminum
hydride
trimethyl antimony sulfate
trimethyl arsine
trimethyl bismuth
trimethyl borine
trimethyl boron
trimethyl chlorosilane
1,1,2-trimethyl dialumene
1,1,2-trimethyl diborane
trimethyl gallium
trimethyl indium
trimethyl phosphine
trimethyl thallium
trimethylbismuthine
tri- n -butylaluminum
tri- n -butylborane
triphenyl aluminum
triphenyl tungsten-
tris(phenyl lithium)-
tris(diethyl ether)
tripropyl antimony
tripropyl boron
tripropyl indium
tripropylaluminum
tripropylaluminum
1,1,1-trimethyl tribromo
dialumene
trisilane
trisilicylamine
trisilyl arsine
trisilyl phosphine
trisilylamine
tris-trifluoromethyl
phosphine

tris(trimethyl silyl)
phosphine
trisulfur dinitrogen dioxide
tritium
trivinyl bismuth
trivinyl stibine
tungsten
unsymmetrical dimethyl
hydrazine
uranium
uranium-bismuth alloy
uranium borohydride
uranium carbide
uranium hydride
uranium hydride
uranium monocarbide
uranium nitride
uranium oxide
vanadium sesquioxide
vanadyl chloride
vinyl trichlorosilane
vinylmethyl tetrazole
triborane
zinc
zinc dimethyl
zinc isoamyl
zinc isobutyl
zirconium
zirconium borohydride
zirconium carbide
zirconium carbonitride
zirconium dibromide