

Common Pyrophoric and Water-Reactive Chemicals at MIT

Classification: Pyrophoric substances are liquids, solids, or gases that will ignite spontaneously in air at or below 130 OF (54.4 OC). Water-reactive substances are substances that react with water or moisture to release a gas that is either flammable or a health hazard. When water contacts a water-reactive substance, enough heat may be generated to cause spontaneous combustion or an explosion. Flame resistant (FR) lab coats are required when handling pyrophoric substances, including chemicals that release flammable gases that may ignite spontaneously and self-heating chemicals that may catch fire (*highlighted blue below*). FR lab coats should also be worn when working with chemicals that react violently with water or release flammable gas (*highlighted yellow*), or when performing potentially vigorous reactions.

Key Phrases: SDSs do not always accurately classify chemicals as pyrophoric. Look both for pyrophoric classifications as well as other key phrases indicative of spontaneously combustible or violent reactions. Examples include "extremely flammable", "catches fire spontaneously", and "reacts violently with air or water". These phrases should trigger a closer look at other safety data sources or outreach to the EHS Office for assistance.

GHS Hazard Statements: The following hazard statements, found in section 2 of the SDS, indicate that the chemical exhibits pyrophoric or water-reactive characteristics that may warrant FR lab coat use.

H220: Extremely flammable gas. FR lab coat required.	H251: Self-heating: may catch fire. FR lab coat required.
H250: Catches fire spontaneously if exposed to air. FR lab coat required	H261: In contact with water releases flammable gases.
H260: In contact with water releases flammable gases which may ignite spontaneously. FR lab coat required.	HNOC: Reacts violently with water

Category/Type		Example Chemicals	CASNO	H250	H251	H260	H261	HNOC	H220		
Hydrides	Metal Hydrides	ALUMINUM BOROXYDRIDE	16962-07-5			X					
		CALCIUM HYDRIDE	7789-78-8			X					
		DIISOBUTYLALUMINUM HYDRIDE	1191-15-7	X		X	X				
		LITHIUM ALUMINUM HYDRIDE	16853-85-3			X					
		LITHIUM BOROXYDRIDE	16949-15-8			X					
		LITHIUM HYDRIDE	7580-67-8			X					
		POTASSIUM HYDRIDE	7693-26-7			X					
		SODIUM BOROXYDRIDE	16940-66-2			X					
		SODIUM HYDRIDE	7646-69-7			X					
		SUPER-HYDRIDE (LITHIUM TRIETHYLBOROXYDRIDE)	22560-16-3			X					
		SODIUM TRIACETOXYBOROXYDRIDE	56553-60-7				X				
		SODIUM TRIETHYLBOROXYDRIDE	17979-81-6				X				
	Non-Metal Hydrides	Arsenic Compounds	ARSINE	7784-42-1						X	
		Boron Compounds	9-BORABICYCLO [3.3.1]NONANE	280-64-8	X		X				
			BORANE TETRAHYDROFURAN COMPLEX	14044-65-6			X				
			BORANE TRIFLUORIDE	7637-07-2			X				
			DIBORANE	19287-45-7	X						X
			DICHLOROBORANE	13701-67-2	X						
			POLYBORANES		X						
			TRIBUTYLBORANE	122-56-5	X						
			TRIETHYLBORANE	97-94-9	X						
			TETRABUTYLAMMONIUM BOROXYDRIDE	33725-74-5				X			
			TETRAFLUOROBORIC ACID-DIETHYL ETHER COMPLEX	67969-82-8				X	X		
		TETRAMETHYLAMMONIUM TRIACETOXYBOROXYDRIDE	109704-53-2				X				
		Phosphorus Compounds	DI-T-BUTYLMETHYLPHOSPHINE	6002-40-0	X						
			DI-TERT-BUTYLPHOSPHINE	819-19-2	X						
			DICHLOROISOPROPYLPHOSPHINE, 97%	25235-15-8			X		X		
			DIPHENYLPHOSPHINE	829-85-6	X						
			PHOSPHINE	7803-51-2							X
			TRI-N-BUTYLPHOSPHINE	998-40-3	X						
			TRI-TERT-BUTYLPHOSPHINE	13716-12-6	X						
			TRIETHYL PHOSPHINE	554-70-1	X						
		TRIBUTYLPHOSPHINE	998-40-3	X							
Silicon Compounds	DICHLOROSILANE	4109-96-0				X			X		
	DISILANE	1590-87-0							X		
	METHYL SILANE	992-94-9					X	X			
	SILANE	7803-62-5	X								
	TRICHLOROSILANE	10025-78-2	X					X			

Metal Powders (Excluding Oxides)		Example Chemicals	CASNO	H250	H251	H260	H261	HNOC	H220
<p><i>NOTE: Many metal powders present special storage and handling concerns when finely divided, including hazards such as air- or water-reactivity or explosive dust generation. Whether a given metal powder exhibits these properties depends on multiple factors, including but not limited to particle size, surface area, moisture level, purity, etc.</i></p> <p><i>Please contact your EHS Coordinator or the EHS Office for assistance when working with small-particle-size metal powders.</i></p>		ALUMINUM	7429-90-5	X			X	X	
		BARIUM	7440-39-3				X	X	
		CADMIUM	7440-43-9	X					
		CALCIUM	7440-70-2	X			X		
		CERIUM	7440-45-1	X					
		CESIUM	7440-46-2			X			
		CHROMIUM	7440-47-3	X					
		COBALT	7440-48-4	X					
		EUROPIUM	7440-53-1	X		X			
		HAFNIUM	7440-58-6	X					
		IRIDIUM	7439-88-5	X					
		IRON H251	7439-89-6		X				
		LEAD	7439-92-1	X					
		MAGNESIUM	7439-95-4	X		X		X	
		MANGANESE	7439-96-5			X			
		NICKEL	7440-02-0	X					
		PALLADIUM	7440-05-3	X					
		PLATINUM	7440-06-4	X					
		PLUTONIUM	7440-07-5	X					
		RHODIUM	7440-16-6	X					
		RUBIDIUM	7440-17-7			X			
		STRONTIUM	7440-24-6			X			
		TANTALUM	7440-25-7	X					
		TECHNETIUM	7440-26-8	X					
		THORIUM	7440-29-1	X					
		TITANIUM	7440-32-6	X		X			
		URANIUM	7440-61-1	X					
		VANADIUM	7440-62-2	X					
		ZINC	7440-66-6	X		X		X	
		ZIRCONIUM	7440-67-7	X		X			

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Non-Metals	WHITE PHOSPHORUS (PHOSPHORUS TETRAMER)	12185-10-3	X					
Metal Halide	TITANIUM (II) CHLORIDE	10049-06-6	X					
Alkali Metals (Group 1)	LITHIUM	7439-93-2			X		X	
	POTASSIUM	7440-09-7			X		X	
	SODIUM	7440-23-5			X		X	
Metal Carbonyls	COBALT CARBONYL	10210-68-1		X				
	CYCLOPENTADIENYL IRON DICARBONYL DIMER	12154-95-9		X				
	DISODIUM TETRACARBONYL FERRATE DIOXANE COMPLEX	59733-73-2	X					
	IRON CARBONYL	13463-40-6	X					
	NICKEL CARBONYL	13463-39-3	X					
Metal-Organic Compounds	Grignard Reagents (R-Mg-X)	ALLYLMAGNESIUM BROMIDE	1730-25-2	X		X		X
		ALLYLMAGNESIUM CHLORIDE	2622-05-1	X		X		X
		BUTYLMAGNESIUM CHLORIDE	693-04-9	X		X		X
		CYCLOHEPTYLMAGNESIUM BROMIDE	78378-12-8			X		
		ETHYLMAGNESIUM BROMIDE	925-90-6			X		X
		ISOBUTYLMAGNESIUM BROMIDE	926-62-5			X		
		ISOBUTYLMAGNESIUM CHLORIDE	5674-02-2			X		
		ISOPROPYLMAGNESIUM CHLORIDE	1068-55-9			X	X	
		METHYLMAGNESIUM BROMIDE	75-16-1			X		X
		METHYLMAGNESIUM IODIDE	917-64-6			X		X
		SEC-BUTYLMAGNESIUM CHLORIDE	15366-08-2	X		X	X	X
		VINYLMAGNESIUM BROMIDE	1826-67-1			X		X
		2,2-DIMETHYLPROPYLMAGNESIUM CHLORIDE	13132-23-5				X	X
		2,2,6,6-TETRAMETHYLPYPERIDINYLMAGNESIUM CHLORIDE LITHIUM CHLORIDE COMPLEX	898838-07-8					X
		PROPYLMAGNESIUM CHLORIDE	2234-82-4				X	
	SEC-BUTYLMAGNESIUM CHLORIDE LITHIUM CHLORIDE COMPLEX	1032768-06-1				X	X	
	(TRIMETHYLSILYLMETHYL)MAGNESIUM CHLORIDE	13170-43-9					X	
	Lithium Compounds & Other Group 1 and 2 Compounds	BIS(CYCLOPENTADIENYL)MAGNESIUM	1284-72-6	X			X	X
		ETHYLLITHIUM	811-49-9	X			X	
		HEXYLLITHIUM	21369-64-2	X		X		
		LITHIUM DIISOPROPYLAMIDE	4111-54-0	X				X
		LITHIUM DIMETHYLAMIDE	3585-33-9	X			X	
		LITHIUM TERT-BUTOXIDE	1907-33-1	X				X
		METHYLLITHIUM	917-54-4	X		X		
		N-BUTYLLITHIUM	109-72-8	X			X	X
		PHENYLLITHIUM	591-51-5	X			X	
		POTASSIUM ETHOXIDE	917-58-8	X				X
		POTASSIUM METHOXIDE	865-33-8	X				X
		POTASSIUM TERT-BUTOXIDE	865-47-4			X		
		PROPYLLITHIUM	1888-75-1	X		X		
		SEC-BUTYLLITHIUM	598-30-1	X		X		
		SODIUM CYCLOPENTADIENIDE	4984-82-1			X		
		SODIUM METHOXIDE	124-41-4	X				X
SODIUM TERT-BUTOXIDE		865-48-5	X				X	
TERT-BUTYLLITHIUM		594-19-4	X		X			
LITHIUM 2,2,6,6-TETRAMETHYLPYPERIDIDE	38227-87-1				X			
LITHIUM AMIDE	7782-89-0				X	X		
SODIUM AMIDE	7782-92-5				X			
Zinc Compounds	DIETHYL ZINC	557-20-0	X		X			
	DIMETHYL ZINC	544-97-8	X		X			
	1-ADAMANTYLZINC BROMIDE	312624-15-0					X	
	CYCLOPROPYLZINC BROMIDE	126403-68-7					X	
Aluminum Compounds & Other Group 13 Compounds	ALUMINUMTRIETHANIDE	97-93-8	X		X		X	
	DIISOBUTYLALUMINUM CHLORIDE	1779-25-5	X		X		X	
	TRIBUTYLALUMINUM	1116-70-7	X		X			
	TRIMETHYLALUMINUM	75-24-1	X		X		X	
	TRIMETHYLGALLIUM	1445-79-0	X		X		X	
TRIMETHYLINDIUM	3385-78-2	X		X	X			
Transition Metal Compounds	BIS(2-METHYLLALLYL) (1,5-CYCLOOCTADIENE)RUTHENIUM(II)	12289-94-0				X		