

(6) Phosphorus trichloride, PCl_3
CAS No. 7719-12-2
HS No. 28.12.10.10
TDG 1809
NIOSH/RTECS No. TH 3675000
Merck 7333

Synonyms: Chloride of phosphorus, phosphorus chloride

Physical Properties: MW:137.3, mp: -111.8, bp: 76°, d 1.574. It is a clear colourless fuming liquid, it is soluble in benzene, chloroform and ether. It is decomposed by water and alcohol.

Synthesis: The trihalides of phosphorus are usually prepared by direct reaction with the halogen under controlled conditions. PCl_3 formation is moderated by combining the elements in the presence of a refluxing precharge of the trichloride with liquid chlorine and phosphorus being continuously introduced; the crude PCl_3 is treated with a further charge of phosphorous and then purified by fractional distillation. Yields of 95% are obtained.

Reactivity: It is extremely reactive. Reaction with alcohols results in $P(OR)_3$; carbanion sources give PR_3 , PR_2Cl and $PRCl_2$; aliphatic hydrocarbons give $RP(O)Cl_2$; oxygen yields Cl_3PO while water or ammonia give hydrolysis and ammonolysis products respectively.

Toxicology: It is poisonous by inhalation and highly toxic by ingestion. It is a corrosive irritant to skin, eyes and mucous membranes. The TLV is 0.5 ppm and the oral LD_{50} is 550 mg/kg (rat). It reacts violently with water and the resulting acids can form hydrogen or reaction with metals. On decomposition, fumes of PO_x which are highly toxic are formed. It appears on the EPA extremely hazardous substance list and reported in EPA TSCA.

Uses: It is an intermediate in the production of phosphorous oxychloride, phosphorous sulfochloride, phosphorous pentachloride and phosphorous acid. It is also the starting material for the production and dialkyl phosphonates, dialkyl alkyl phosphonates and trialkyl phosphites.

Suppliers: Twenty-six producers are listed: these are Brazil (1), USA (6), PCR (6), India (3), Japan (4), France (2), Germany (1), UK(1), Italy (1) and Switzerland (1).