

# YELLOW PHOSPHORUS

## PRODUCT IDENTIFICATION

CAS NO.	7723-14-0	P
EINECS NO.	231-768-7	
FORMULA	P <sub>4</sub>	
MOL WT.	123.88	
H.S.CODE	2804.70	
TOXICITY	Oral rat LD50: 3030 ug/kg	
SYNONYMS	Phosphorus (white); Phosphorous yellow; Phosphorus (red); Black Phosphorus; Fosforo Bianco (Italian); Gelber Phosphor (German); Phosphore Blanc (French); Phosphorous (White); P Tetrafosfor (Dutch); Tetraphosphor (German); Violet Phosphorus; Weiss Phosphor (German);	
DERIVATION		
CLASSIFICATION		

## GENERAL DESCRIPTION

Phosphorus is a nonmetallic chemical element in group 15 (nitrogen family, formerly Va) of periodic table; atomic number 15 atomic mass 30.9738; melting point ca 44.1 C (white); boiling point ca 280 C (white); specific gravity 1.82 (white), 2.34 (red), 2.70 (black); valence -3, +3, or +5 ; electronic config. 2-8-5 or 1s 2s 2p 6 3s 2 3p 3. The phosphorus molecule is composed of four phosphorus atoms, P<sub>4</sub>. Phosphorus exists in a number of allotropic forms [white (alpha and beta), red, black and/or violet] in the same physical state. White phosphorus is a white to yellow waxy substance which ignites spontaneously in air to form white fumes of phosphorus pentoxide and glows without emitting heat. Phosphorus is stored underwater as it is extremely poisonous, insoluble in water (but soluble in carbon disulfide). Commercial production of elemental phosphorus is prepared from phosphorite or phosphate rock (apatite, an impure calcium phosphate mineral) reacting with coke and sand or silica pebbles or at high temperatures in an electric furnace. Calcium silicate is produced as a by-product. White phosphorus is used as a deoxidizing agent in the preparation of steel and phosphor bronze. It is also used in rat poisons and to make smoke screens (by burning) for warfare. When white phosphorus is heated to about 250 C with air absence, it changes into the red phosphorus. Red phosphorus, a dark redish powder or crystal, does not ignite spontaneously unless heated to 200 C, does not phosphoresce and it is a little less dangerous than white phosphorus. It is used to make matches. Red phosphorus is prepared commercially by heating calcium phosphate with sand and coke in an electric furnace. Black allotrope is obtained industrially by heating at 300 C under pressure with a mercury catalyst. It has a layer structure and is stable. The major use of phosphorus compounds is in fertilizers, mainly as a mixture called superphosphate (calcium hydrogen phosphate), obtained from phosphate minerals by sulfuric acid treatment; and in nitrophosphates. Phosphorus is burned to make phosphorus pentoxide [phosphorus(V) oxide], a white solid used as a chlorinating agent in organic chemistry, as a drying agent and mainly converted to phosphoric acid used to make phosphates for fertilizers, electro chemical polishing and shaping, electroplating, metal cleaning and pickling in metal treatment by reaction with water. Phosphorus is highly reactive. A wide range of compounds is formed for uses in detergents, water softeners, pharmaceuticals, dentifrices, and in many other important applications. It forms metal phosphides and covalently bonded phosphorus(III) and phosphorus(V) compounds. Phosphoric acid can combine with certain alkaline elements to form salts called phosphates.

## PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	a number of allotropic forms
MELTING POINT	44 C (white), 590 C (red)
BOILING POINT	280 C (white), sublimes (red)

SPECIFIC GRAVITY	1.82 (white), 2.34 (red), 2.70 (black)
SOLUBILITY IN WATER	insoluble
pH	
VISCOSITY	
VAPOR DENSITY	
AUTOIGNITION	
NFPA RATINGS	Health: 3 Flammability: 0 Reactivity: 1
REFRACTIVE INDEX	
FLASH POINT	30 C(white), 260 C(red)
STABILITY	Stable under ordinary conditions
APPLICATIONS	
Phosphoric acid, sodium phosphates, calcium, ammonium and potassium phosphates, phosphorus trichloride, pentasulfide and pentoxide.	
SALES SPECIFICATION	
WHITE/YELLOW PHOSPHORUS	
APPEARANCE	white to straw yellow waxy solid
ASSAY	99.0% min
INSOLUBLES IN DILUTE NITRIC ACID	0.1% max
ACIDITY (H <sub>3</sub> PO <sub>4</sub> )	0.2% max
SULFUR	0.1% max
RED PHOSPHORUS	
APPEARANCE	red to violet amorphous powder
ASSAY	98.5% min
SOLUBLES IN WATER	1.0% max
WHITE PHOSPHORUS	0.003% max
MOISTURE	0.25% max
ACIDITY (H <sub>3</sub> PO <sub>4</sub> )	0.1% max
TRANSPORTATION	
PACKING	250kgs in drum (white), 50kgs in drum (red)
HAZARD CLASS	4.2, 4.1
UN NO.	1381 (yellow), 1338 (red)
OTHER INFORMATION	