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## Phosphorus, Sulfur, and Silicon and the Related Elements

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713618290>

## Tetraphosphorus Hexoxide-Manufacture and Application

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**To cite this Article** Eiserbeck, W. , Feike, E. and Schülke, U.(1990) 'Tetraphosphorus Hexoxide-Manufacture and Application', *Phosphorus, Sulfur, and Silicon and the Related Elements*, 51: 1, 470

**To link to this Article:** DOI: 10.1080/10426509008040994

**URL:** <http://dx.doi.org/10.1080/10426509008040994>

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## TETRAPHOSPHORUS HEXOXIDE - MANUFACTURE AND APPLICATION

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Tetraphosphorus hexoxide,  $P_4O_6$ , is a starting material for the manufacture of inorganic and organic phosphorus compounds.

A continuous process at normal pressure for the manufacture of  $P_4O_6$  in laboratory scale (1 kg  $P_4O_6$ /h) is described. In this process phosphorus vapour reacts with an oxygen-inert gas mixture in a molar ratio  $P_4:O_2 = 1:3$  in a combustion chamber and the reaction products are stabilized and condensed by cooling in three sequential stages. In the first stage the reaction products are indirectly cooled with water, in the second stage directly with an inert gas, preferably nitrogen. The quenching rate of these two steps is  $(0,1-10) \cdot 10^6 \text{ K} \cdot \text{s}^{-1}$ . In the third stage the reaction products are condensed in a water cooled washer under addition of liquid  $P_4O_6$ . The waste gas is purified by means of an electrostatic filter.  $P_4O_6$  is filtered or distilled off from the byproducts (phosphorus(III/V)-oxides, phosphorus suboxide); molar yield 85%.

$P_4O_6$  reacts both with electrophilic and nucleophilic compounds. Reaction products of technical interest are phosphorous acid and phosphites, aminomethylene phosphonic acids, hydroxyalkylene diphosphonic acids, aminoalkylene diphosphonic acids, and N-substituted aminoalkylene diphosphonic acids. These compounds are used as water softeners, stabilizers, adhesives, corrosion inhibitors, and flotation agents.