

Why should Elemental Phosphorus (P₄) and Purified Phosphoric Acid (PPA) both be on the EU list of “Strategic Raw Materials” ?

Elemental phosphorus (P₄¹) and PPA are essential for all of the “Strategic” industry sectors defined by the EU in the proposed Critical Raw Materials Act: batteries, renewable energies, electronics and data, aerospace.

Without them it is impossible to manufacture chemicals necessary for the following Strategic sector uses:

- **Batteries:** lithium ion battery electrolytes (LiPF₆)^{*}, lithium iron phosphate battery cathodes (LiFePO₄)^{**}.
- **Electronics:** microchip production^{*}, semiconductors doping^{*}, indium phosphide semiconductors^{*}, diodes^{*}
- **Photovoltaic panels (PV):** doping of n-silicon^{*}.
- **P-acid fuel cells**^{**}
- Lubricants for jet engines^{*}.
- Steel **anticorrosion**^{**}.
- **Fire safety** of polymers, composites, natural and synthetic fibres, wood, hydraulic fluids (power and control systems), etc., e.g. in aviation and transports, electronics and electrical systems, batteries ^{***}
- **Catalysts**^{*} and chemical processing^{*}: e.g. thiophosphinates for the production of the CRM cobalt (used in batteries, magnets)

P₄ and PPA are also essential for other vital EU industry sectors:

- **Pharmaceuticals:** organo-phosphorus based drugs, such as e.g. anticancer drugs: evofosfamide, amifostine, polyestradiol phosphate^{*}, inorganic phosphate pharmaceuticals^{**}
- **Food industry**^{**}: food preservatives, processing agents, “low salt” baking powders

** elemental phosphorus (P₄ and derivatives) ** purified phosphoric acid *** both*

Electrical and electronic equipment, data systems, renewable energy systems, batteries, aerospace: these all need phosphorus-based flame retardants to meet fire safety requirements. This is crucial to meet obligatory safety standards (in ‘Strategic’ sectors, for example in electrical and electronic equipment², or in transport uses³) and to achieve proactive industry safety specifications.

Fire safety requirements and the need for phosphorus flame retardants are increasing for all of the “Strategic” industry sectors, due to fire risks related to batteries, ubiquitous electronics (connectedness of things), data transmission dependency. Phosphorus flame retardant demand is growing 6-8% per year⁴.

The EU is 100% dependent on imports of elemental phosphorus (P₄) and derivatives, and supply is almost entirely limited to two countries: Kazakhstan and Vietnam. China has largely stopped exports (restrictions, tariffs) and Vietnam has also recently restricted. Furthermore, investment of around 20 billion € in phosphoric acid purification capacity is needed to supply PPA for “Strategic” industries in coming decades.

Including Elemental Phosphorus (P₄) and PPA (Purified Phosphoric Acid) in the “Strategic Raw Materials” list would allow “Strategic Projects” and appropriate company cooperation to re-establish P₄ production in Europe and to invest in acid purification capacity. **An EU-funded project is developing technology to produce high-quality P₄ from wastes**⁵. Inclusion of Elemental Phosphorus in the “Strategic Raw Materials” list would enable the public-private cooperation necessary for industrial implementation. This could enable the EU to achieve independence in P₄ supply. Several technologies are also today being implemented⁶ to recover high-quality phosphoric acid (PPA) from sewage sludge incineration ash and other wastes, with significant development potential.

The signatory organisations and companies therefore request the European Parliament and Council to amend the proposed Critical Raw Materials Act COM(2023)160 (Annex 1, §1) to add to the list of “Strategic Raw Materials”⁷:

- **Elemental Phosphorus (P₄ and derivatives), and**
- **Purified Phosphoric Acid**

¹ Elemental phosphorus = P₄ (also called “white” or “yellow” phosphorus) and derivatives

² IEC standards: International Electrotechnical Commission <https://www.iec.ch/>

³ Strict fire safety standards apply in transport, eg. IMO for shipping, FAA for aviation, EN45545 for railways

⁴ Summary of a number of market studies in pinfa Newsletter n°148 www.pinfa.eu

⁵ **Flashphos** P₄ recovery from e.g. from sewage sludge and incineration ashes.

⁶ Nutrient recycling technology catalogue : <https://www.phosphorusplatform.eu/techcatalogue>

⁷ Both “Phosphorus” (meaning P₄) and “Phosphate Rock” (effectively meaning phosphoric acid) are already on the “Critical Raw Materials” list. They should now be also included in the “Strategic Raw Materials” list.

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