

LANXESS's views on European Critical Raw Materials Act

“Elemental Phosphorus (P₄)” to be included in the “Strategic Raw Materials” list given its high strategic importance as a key enabler for the green transition

LANXESS AG | 05 May 2023

LANXESS AG (“LANXESS”) welcomes the opportunity to contribute to the European Commission's proposal to establish a framework for ensuring a secure and sustainable supply of critical raw materials (so called “European Critical Raw Materials Act”).

Critical Raw Materials are fundamental to strengthen EU's industry competitiveness, economic resilience and strategic autonomy while undergoing the green and digital transition by securing the EU's growing supply of critical raw materials along all stages of the strategic raw materials value chains, including the extraction, processing and recycling of strategic raw materials.

1. “Phosphorus” shall be renamed as “Elemental Phosphorus (P₄ and derivatives)”

LANXESS acknowledge that “phosphorus” and “phosphate rock” have been included in the “Critical Raw Materials” list in the EU Commission’s proposal for a European Critical Raw Materials Act. However, **“phosphorus” should be renamed as “Elemental Phosphorus (P₄ and derivatives)”**.

Elemental phosphorus (P₄), also called “white phosphorus” or “yellow phosphorus”, is the elemental form of phosphorus which is produced from phosphate rock by a thermal process in P₄ ovens.

Currently, **there is no production of Elemental Phosphorus (P₄) in Europe**. The last furnace located in Europe closed in 2012. This means that the **EU entirely depends on imports mainly from Vietnam and Kazakhstan**.

2. “Elemental Phosphorus (P₄)” to be included in the “Strategic Raw Material” list

Given the high strategic importance of elemental phosphorus (P₄) as a key enabler of the green transition and to strengthen the EU’s economic resilience and strategic autonomy, elemental phosphorus (P₄) **shall also be included in the “Strategic Raw Materials” list**.

This high supply risk of phosphorus is acknowledged in the JRC Report¹ and CEA Report².

The economic importance of Elemental Phosphorus (P₄) should also be recognised not only due to the **limited diversification of external supply** but specially because of the **impossibility to be substituted by other raw materials used in strategic technology applications**

¹ JRC Foresight Report 2023 “Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU – A foresight study”, S. Carrera et al., ISBN 978-92-68-00339-8 (266 pages) <https://publications.jrc.ec.europa.eu/repository/handle/JRC132889>

² SCREEN2 (“Solutions for Critical Raw materials - a European Expert Network 2) draft Fact Sheets <https://screen.eu/crms-2023/>

from strategic value chains (e.g. batteries, ICT, energy storage, defence), as explained below.

3. “Elemental phosphorus (P₄)” is essential for the production of key strategic technologies within the strategic European value chains

Elemental phosphorus (P₄) is essential for the production of many phosphorus derivatives which are used to produce **electronics, semiconductors, batteries**, fire safety polymers and materials, hydraulic fluids, lubricants, pharmaceuticals, agrochemicals, catalysts, metal alloys, and among others, and also it has an essential use in strategic technologies such as, for example, in **e-mobility, in energy storage and in fire safety of “data storage and servers”**, among other essential uses **within the strategic European value chains**.

3.1. Battery and energy storage value chains

For instance, in the production of batteries, **LiPF₆ is the dominating conductive salt for electrolytes and the whole battery value chain depends on it. LiPF₆ can only be produced from elemental phosphorus P₄**, and not from other phosphorus sources (e.g., wet route phosphoric acid). Transportation of LiPF₆ is difficult as it is not stable against humidity and air.

P₄-based derivatives can also be used to produce LiFePO₄ for **lithium iron phosphate (LFP) battery cathodes**. P₄-based derivatives typically have a higher purity when compared to purified phosphoric acid as a raw material for LFP.

Both battery applications in LiPF₆ / electrolytes as well as in LFP cathodes are expected to grow massively in the next years to support the green transition on e-mobility and energy storage.

Therefore, **elemental phosphorus (P₄) is of high strategic importance for the production of LiPF₆ and LFP in the EU to be used in strategic technologies to underpin the green transition as part of the strategic European battery and energy storage value chains**.

3.2. ICT value chain: Microelectronics and high performance computing

Thermal phosphoric acid (i.e., phosphoric acid produced from “Elemental Phosphorus (P₄)”) is also used for microchip etching and in semiconductor doping.

3.3. Aerospace, renewable energy (wind turbines) and electric vehicles value chains: Lubricants based on P₄

Lubricants based on P₄ are essential for aerospace, renewable energy (wind turbines) and electric vehicles to reduce wear and corrosion under pressure leading to longer lifetimes of hydraulic systems and components.

3.4. Other strategic uses for “Elemental Phosphorus (P₄)”

Fire safety is of high importance in all value chains that were identified as strategic: Electronic and electrical systems (circuit boards, components, wires and cables, optical fibres, casings, etc), 3D-printing, renewable energy (PV, wind turbines), batteries, electric vehicles, aerospace, etc. All phosphorus flame retardants used in polymers, composites, fire-safe coatings, electrolytes are produced from elemental phosphorus P₄, and therefore are necessary to reduce fire risks and to ensure obligatory product fire safety standards.

4. Strengthening consumption of strategic raw materials using secondary raw materials

The European Critical Raw Material Act aims that the EU's consumption of strategic raw materials is partially covered by secondary raw materials, which would improve both the security and sustainability of the EU's raw material supply.

Therefore, if Elemental Phosphorus (P₄) is not included in the strategic raw materials list, **several recycling projects which are under development to produce very high-purity elemental phosphorus (P₄) in Europe from secondary materials (such as sewage sludge) would not be considered as a Strategic Project** under the European Critical Raw Materials Act.

These projects are not yet at a commercial scale and further work and funding is required to enable full-scale development and implementation of these technologies.

Thus, it would be extremely important that Elemental Phosphorus (P₄) is recognized as a “Strategic” raw material to foster alternative and sustainable elemental phosphorus (P₄) sources in Europe, with a very low product carbon footprint.

LANXESS is a leading specialty chemicals company with sales of EUR 8.1 billion in 2022. The company currently has about 13,100 employees in 33 countries. The core business of LANXESS is the development, manufacturing and marketing of chemical intermediates, additives and consumer protection products. LANXESS is listed in the leading sustainability indices Dow Jones Sustainability Index (DJSI World and Europe) and FTSE4Good.

Sustainability is a core value of LANXESS's business. LANXESS aims to be a climate neutral company in terms of Scope 1 and 2 emissions by 2040³. By 2030, we aim to reduce the greenhouse gas emissions achieved in 2018 by more than half. This would mean a reduction of 80% compared to the emissions produced by LANXESS when it was founded.

LANXESS also set a target for indirect emissions from the upstream and downstream supply chain (Scope 3). The so-called “Net Zero Value Chain” initiative⁴. With this initiative, LANXESS intends to have the entire supply chain climate-neutral by 2050. By 2030, Scope 3 emissions are to be reduced by 40% compared with the base year 2015.

³ [Climate-Neutral 2040 \(lanxess.com\)](https://www.lanxess.com/en/press-releases/2022/09/2022-09-14-climate-neutral-2040)

⁴ [Net Zero Value Chain \(lanxess.com\)](https://www.lanxess.com/en/press-releases/2022/09/2022-09-14-net-zero-value-chain)