

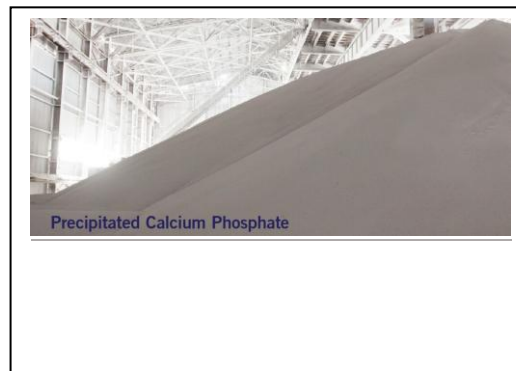
Calcium phosphate from sewage sludge ash by “Ash2Phos” process



Keywords: sewage sludge ash • clean phosphorus product • hydroxyapatite

Key facts:

- **Product Category:** 1.C. 1. a: Solid inorganic macronutrient fertiliser
- **Input material:** Sewage sludge ash
- **General appearance:** White powder or granule
- **Nutrient Content (N-P-K %):** 0-39-0
- **Product market status:** Pilot production (high volumes available on market 2023)
- **Limitation of application:** none in practical terms, high versatility; but hindrance in feed and organic farming legislation
- **MS Authority permit availability:** Production permit in Sweden
- **Geographical area:** Europe
- **Product price:** In 2023 on the market, price is market sensitive



Summary:

EasyMining is focused on creating circular material flows from waste. Via the food cycle, phosphorus ends up in sewage sludge. The phosphorus content of ash from incinerated sewage sludge is high, and through the unique patented Ash2Phos process, it is possible to extract clean commercial phosphates from the ash. Precipitated calcium phosphate (PCP) is a phosphorus-calcium rich product ($\text{Ca}_5(\text{PO}_4)_3\text{OH}$, 17% P, 35% Ca) with a very low content of heavy metals ($\text{Cd} < 0.1 \text{ mg/kg}$). The water solubility is low, but P is highly available as demonstrated by the high solubility in neutral ammonium citrate. It is already proven that phosphate is slowly released, the fertilizing efficiency is therefore high. It can be applied as such on the field (as root placed fertilizer or spread as granules with common equipment), or transformed to other phosphate fertilizers (MCP, DCP, MAP, DAP, etc). In addition, PCP can also be used for animal feed, compound feed and mineral feed. In 2023, 13,000 t/a PCP (from 30,000 t ash) will be produced. The price is matter of market and negotiation.

How to use:

- **Type of farming:** low input, conventional
- **Cultivation methods:** open field, greenhouse
- **Recommended crops:** depends on final formulation
- **Application doses:** depends on fertiliser type, soil, crop etc.

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Key product features:

- Precipitated calcium phosphate ($\text{Ca}_5(\text{PO}_4)_3\text{OH}$)
- Low in heavy metal
- White powder or granule
- Odourless
- Cas No 1306-06-5

Key product benefits:

- High purity: i.e. Cd content < 0.1 mg/kg
- Slow release fertiliser: Low water solubility, but phosphorus is highly available as demonstrated by the high solubility in neutral ammonium citrate – so low losses to environment
- high P content in PCP
- PCP can be considered as P from renewable sources (like sludge ash)

Competitive position and advantages:

With the Ash2Phos technology, a clean precipitated calcium phosphate (PCP) can be recovered from sewage sludge. Heavy metal and fluorconcentrations are lower than in conventional P fertilizers (Cd < 0.1 mg/kg). Therefore, it can be used for field application and in feed products.

The P recovery process is independent from ash quality fluctuations (so no limitations regarding precipitation metals like Fe) and comes with highly efficient heavy metal separation to guarantee high P product quality.