The RECOPHOS-Process
P4 from Sewage Sludge Ashes

01.12.16
P – an essential Element
• Estimated Phosphate Reserves: appr. 71 bill. Tons
• Total Production: appr. 230 mill. Tons per Year
• Estimated secured Supply Time: > 300 years
• But Europe has lack of Phosphate Resources, and therefore needs Imports up to 10 mill. Tons
Figure 2: World rock phosphate mine reserves 2005. (Data source: Röhling, 2007.)

- **United States**: 6%
- **Morocco / W. Sahara**: 34%
- **Brazil**: 2%
- **Jordan**: 5%
- **South Africa**: 9%
- **Russia**: 1%
- **Israel**: 1%
- **China**: 39%
- **Others**: 3%
P-Recycling Potential of Germany up to 19,000t/a,

Of which > 50% is already economically interesting and growing.

P-Recycling is requested by the EU and German Government

Several Recycling Processes in Test & Development

Other European Countries in similar situation or even advanced
The RECOPHOS-Process

- Phosphate containing residues
- Recophos process
  - Phosphor
  - Molten slags
  - Metal melt
The RECOPHOS-Process

Input: Sewage sludge ash

H$_3$PO$_4$ + H$_2$O

P$_2$O$_5$ + O$_2$

Output: Distilled phosphorus + CO to combustion

Water-cooled primary induction coil

Manifold for gas distribution (optional)

Inductively heated carbon packed bed (= "secondary coil")
ca. 1300 °C

Output: Liquid slag, metal melt (mainly Fe)

SOURCE: Team visit to site and subsequent analysis
Phosphorus for many Applications

- Phosphoric Acid (TG, FG, EG)
- FG/TG-Phosphates (Na, K, Ca, NH4, Mg)
- Phosphorus Chlorides (PCl3, POCl3, PCl5)
- Phosphorus Pentasulfide (P2S5)
- Phosphorus Oxides (P2O5, P2O3)
Thank you