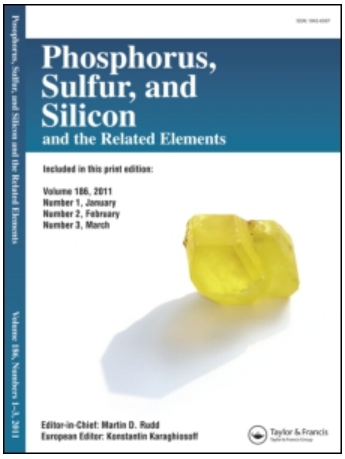

Phosphorus, Sulfur, and Silicon and the Related Elements
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713618290

Decomposition Mechanism of Hydroxyfluorapatite in Phosphoric Acid-Thermal Treatment

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To cite this Article Poldme, M. , Raude, U. , Aruväli, J. and Utsal, K.(1990) 'Decomposition Mechanism of Hydroxyfluorapatite in Phosphoric Acid-Thermal Treatment', Phosphorus, Sulfur, and Silicon and the Related Elements, 51: 1, 441
To link to this Article: DOI: 10.1080/10426509008040965
URL: http://dx.doi.org/10.1080/10426509008040965

Phosphorus, Sulfur, and Silicon, 1990, Vols. 51/52, p. 441
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DECOMPOSITION MECHANISM OF HYDROXYFLUORAPATITE IN PHOSPHORIC ACID - THERMAL TREATMENT

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Hydroxyfluorapatite (HFA), an apatite mineral in phosphate rock from the Kovdor deposit (U.S.S.R.), is used in rotary kiln manufacturing of an animal feed supplement.

The studies presented here have been made for the determination of the causes when non-conditional product, from the point of view of its residual fluorine content, (>0.2 %), is obtained. HFA with 1.0 % F content, heating products of HFA, mixtures of apatite concentrate, HFA, calcite and dolomite with H_3PO_4, $Ca_2P_2O_7$ and $Ca(PO_3)_2$, as well as sample from the plant were investigated. The heating products were studied by X-ray diffraction, thermal, scanning electron microscopic and chemical methods.

On the basis of the fluorine content and unit cell dimensions of apatite in heated products it was found that in this process HFA transformation into fluorapatite takes place to a greater or lesser extent depending on the fluorine evolving conditions. Apatite decomposes as a result of interaction between H_3PO_4, calcium-magnesium condensed phosphates, SiO_2 and $Ca_3(PO_4)_2$-$Mg_3(PO_4)_2$ melt. The formation of β-$Ca_3(PO_4)_2$ begins at temperatures 700-750°C. Tricalcium phosphate (TCP) formation through β-$Ca_2P_2O_7$ and $Ca_4P_2O_9$ was determined. TCP, amorphous to X-rays, was found. $(Ca,Mg)_3(PO_4)_2 \cdot xFePO_4$ with varying Mg and Fe content was synthesized at process temperatures. By comparing the lattice parameters of β-$Ca_3(PO_4)_2$ in the TCP prepared and in various samples of clincer, it was concluded that in the studied process the major portion of Mg and Fe from impurities is transmitted into TCP structure. It was found that in connection with increase in Mg content in TCP the height of the peaks d_{214} and $d_{1.0.10}$ increases 1.2 times, but that of d_{214} and d_{220} decreases 1.45 times.