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## Phosphorus, Sulfur, and Silicon and the Related Elements

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### Study of Phosphorus Reduction Regularities from Metal Orthophosphates

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## STUDY OF PHOSPHORUS REDUCTION REGULARITIES FROM METAL ORTHOPHOSPHATES

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The reserves of high quality phosphorites being limited, greater importance is attached to new kinds of phosphorus-containing raw materials, for instance phosphate-ion, which is presented not only by calcium orthophosphate but also by phosphates of other metals. For studying general regularities of obtaining phosphorus from different kinds of phosphate the reduction of metal orthophosphates was researched according to their placement in Mendeleev's Periodic System (metal orthophosphates of 2A-group and of the 3-rd period). Equilibrium compositions of products of interactions in systems  $Me_x(PO_4)_y$ -reducer-mineral addition were calculated, where Me-Mg, Ca, Sr, Ba, Na, Al, Si, Fe. Conditions of maximum yield of phosphorus at different correlations of components were determined. The effect of the phosphates nature on reduction with different reducers ( $CH_4$ , C,  $H_2$ , CO) was investigated by means of spectroscopy and diffractometer, IRS, crystal optics and chromatography. Optimum conditions were determined for phosphorus reduction from orthophosphates, and their charges. Influence of basic parameters on the process under investigation was studied as well as composition and properties of the outcoming solid and gaseous products, and primary, secondary and side-reactions. Some regularities of the reduction process were determined. It was shown that, according to their properties and reduction abilities, the investigated orthophosphates may be arranged in succession  $Si_3(PO_4)_4$  -  $AlPO_4$  -  $Mg_3(PO_4)_2$  -  $Ca_3(PO_4)_2$  -  $Sr_3(PO_4)_2$  -  $Ba_3(PO_4)_2$ . The results serve as a theoretical basis for the selection of optimum phosphat charges in the technology of obtaining phosphorus.