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STUDIES ON THE PRODUCTION OF PHOSPHATE FERTILIZER FROM EPPAWELA APATITE USING SODIUM CARBONATE AND QUARTZ

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The main methods for the conversion of apatite, $Ca_5 (PO_4)_3 (F,Cl, OH)$, to more soluble phosphorus fertilizer are acidulation and thermal treatment. Difficulties encountered in the acidulation process of Eppawela apatite with Paranthan hydrochloric acid have been discussed previously (Jayasekara, Tennakoon & Gunawardane, 1978). In this study an alternative process for the conversion of Eppawela apatite to phosphorus fertilizer using sode ash and quartz by the process of thermal treatment was studied.

Compositions having different molar ratios of apatite: $Na_2 CO_3$ and apatite: $Na_2 CO_3$: SiO_2 were fired at temperatures in the range 900-1300°C and the products were subsequently analysed for $P_2 O_5$ soluble in 2% citric acid. In certain cases the products were identified by X-ray diffraction.

Molar ratios of apatite: $Na_2 CO_3$: SiO_2 close to 1:2:1 gave the best product with 26-28% P_2O_5 soluble in 2% citric acid. This value corresponds to a conversion of almost 100%. Reduction of the soda content from this optimum molar ratio lead to incomplete reaction while reduction of silica content lead to the appearance of free lime in the product.

Compositions close to the molar ratio 1 part apatite to 2 parts $Na_2 CO_3$ and 1 part SiO_2 and temperature of about 900°C appear to be well suited for the suggested process.

(High temperature studies and X-ray identification of phases were carried out at the Department of Chemistry, University of Aberdeen, U.K. with assistance from Dr. F. P. Glasser)

References:

1. Jayasekara, K. S., Tennakoon, D. T. B., Gunawardane, R. P. (1978), Proceedings of the Sri Lanka Association for the Advancement of Science, 34, Part 1, 59.