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EFFECTS OF IMPURITIES OF ROCK PHOSPHATE DEPOSITS IN SRI LANKA ON THE PRODUCTION OF FERTILIZER FOR SHORT TERM CROPS

G.T.D. Chandrakumara[1,2*], N.W.B. Balasooriya[1,2], M.M.M.G.P.G. Mantilaka[2] and H.M.T.G.A. Pitawala[1,2]

[1]Department of Geology, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka
[2]Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka
[*]dilharagt@gmail.com

Rock phosphate deposits formed by weathering of carbonatites are found at Eppawala and Kawisigamuwa, Sri Lanka. Both deposits are made up of the same types of primary and secondary phosphate minerals. Currently, rock phosphate mining occurs only at Eppawala deposits to produce phosphate fertilizer for long-term crops. After sorting the primary apatite crystals, high-grade rock phosphate fertilizer is produced, and the remaining materials are used to make low-grade fertilizer. Although several studies have measured the major and minor element contents of parent carbonatites, the geochemistry of secondary ore bodies important for mining and beneficiation is still not well-known. This research aimed to comprehend the chemical compositional variation of the secondary ores to evaluate their beneficial potential as fertilizers. Herein, major and minor element contents of representative ore samples (n = 28) were measured using an Inductively Coupled Plasma-Optical Emission Spectrometer and Inductively Coupled Plasma-Mass Spectrometer. According to the results, the major components of the ores were P_2O_5, CaO, Fe_2O_3, SiO_2, Al_2O_3, and TiO_2, having weight percentages of 2.80 – 39.81, 2.38 – 52.13, 5.47 – 48.88, 0.27 – 47.09, 1.44 – 22.68, and 0.06 – 2.73, respectively. The average concentrations of Na_2O, MnO, K_2O, and MgO were below 1 wt%. The U and Th content were below the detection limit. Therefore, any impacts from the radioactive elements may be negligible. Since major elements showed high variations in distribution, the ore bodies were highly heterogeneous in terms of chemical composition due to the mixing of weathered material in a karst environment. Even though some areas were highly enriched with P_2O_5, impurities such as Fe_2O_3, SiO_2, and Al_2O_3 were intense. R_2O_3 content (Fe_2O_3+Al_2O_3) of the matrix was in the range of 6.91 – 51.74 wt%, which exceeded the maximum allowable level (5 wt%) for the fertilizers. Elevated levels of R_2O_3 are toxic to plants if they become bioavailable. Direct application of this matrix without any purification process may be harmful to long-term crops. Furthermore, such impurities may have a significant impact when used to produce fertilizer for short-term crops. As a result, physical separation of such contaminants from the phosphate matrix is recommended before beneficiation.

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