VARIABLE MINERALOGY AND SOLUBILITY OF A TERRESTRIAL PHOSPHORITE RESULTING FROM DIFFERENTIAL WEATHERING PHENOMENA - AN EXAMPLE FROM SRI LANKA

DAHANAYAKE K.*, ** and SUBASINGHE S.M.N.D. *
* Earth Sciences Division, Institute of Fundamental Studies, Kandy, Sri Lanka
and
** Department of Geology, University of Peradeniya, Sri Lanka

ABSTRACT

In the hamlet of Eppawala in North Central Sri Lanka, about 200 km from its capital, Colombo, lies a large phosphate deposit with a known reserve of 40 million metric tonnes (Fig. 1). At the present rate of consumption of this phosphate deposit, the ore is sufficient for more than 100 years. Currently, the phosphate material is crushed to fine size and mixed with other ingredients for uge as fertilizer in long term crops such as tea, rubber and coconut.

The phosphate deposit at Eppawala is essentially a thick weathering profile which has developed on a Precambrian apatite marble formation associated with migmatitic gneisses cut by scapolite-diopside dikes. The dikes have in their core a significant apatite mineralisation. Field and laboratory studies on the weathering profile have helped the authors to identify the same as a terrestrial phoscrete-type phosphorite that had formed due to tropical weathering, erosion and sedimentation processes operative on the phosphate rich parent rocks (Dahanayake and Subasinghe, 1989 a,b). The Eppawala phosphorite consists principally of primary chlor-fluor apatite crystals disseminated in secondary sedimentary matrices. These support allochems such as peloids, intraclasts and coated grains - coated grains being mainly primary apatite grains with concentric laminations formed of secondary phosphate. The matrix at points shows ferruginous and clayey regions resulting from the weathering of gneisses and dikes. These deposits are intermingled with stromatolitic laminations (Dahanayake and Subasinghe, 1988).

Based on P_2O_5 compositions, ideally, two compositional zones can be differentiated : (a) lateritic horizon - 10 to 15% P_2O_5 and (b) phosphate enriched horizon -10 to 40% P_2O_5. These two horizons can be found to be associated with each other in a vertical as well as a diagonal sense. Depending on the morphology manifested by the hillock which encompasses the phosphate deposit, and due to merging of the two ideal horizons at certain points, significant local compositional variations could be observed.

The phosphoritic regions of the Eppawala deposit are concentrated mostly on the enriched horizon. However appreciable phosphoritic regions are observed in the lateritic horizon large primary apatite crystals are found in hardened or loose matrices. The phosphoritic horizons seem to undergo several stages of weathering in different microenvironments within the tropical soil profile at Eppawala, when weathered give rise to loose soil regions typified by isolated fine apatite crystals. The weathering produces different types of secondary phosphate minerals.

At least one principal process of secondary phosphate mineralization could be noticed in the Eppawala deposit. The primary apatite grains show a process of grain diminution by way of fine grained microorganism-mediated secondary phosphate mineralizations around their margins. The ultimate products of such phosphate mineralization are called peloids (Soudry and Nathan, 1980). Eventually the