

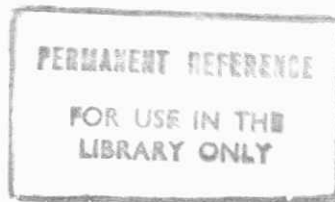
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**MINERALOGICAL, SEDIMENTOLOGICAL AND SOLUBILITY STUDIES OF  
PHOSPHATE DEPOSITS IN SRI LANKA WITH SPECIAL REFERENCE  
TO THE EPPAWALA APATITE MARBLE FORMATION**

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## ABSTRACT

The Eppawala phosphate deposit of Northcentral Sri Lanka is a large deposit with an estimated reserve of more than 40 million metric tonnes. On the basis of colour, texture and structure, several phosphate types have been located. Laboratory analyses suggest variable apatite mineralogies,  $P_2O_5$  compositions and solubility variations in different sectors of the deposit. The single primary apatite crystals which are disseminated in secondary phosphate groundmasses give high  $P_2O_5$  values (between 35 to 42%). The groundmass shows  $P_2O_5$  values of less than 30%. The crystals manifest lower combined aluminium and iron percentages and higher solubilities than the groundmass. Present study strongly suggests that Eppawala deposit be selectively mined at least to single out the primary crystals which are of better ore quality than the groundmass.

The groundmass however constitutes about 70% of the deposit. Selected samples of this poorly soluble segment of the Eppawala phosphate deposit were buried in the tidal zones around the man-made islands of the Muthurajawela peat deposit for fixed periods of time. The sulphuric acid-rich waters that form due to the oxidation of freely-available pyrite in the tidal zones have enhanced the solubility of the buried samples sometimes four-fold. Significant variations of solubility were observed in different size fractions that occur naturally in the loose groundmass of the phosphate deposit.

Due to tropical weathering conditions active on the Eppawala Phosphate Deposit of Sri Lanka, degradation of the ore has occurred at some points. Equal volume replacement of apatite by quartz is one of the degrading processes. This may be due to the force of crystallization which has been recognized as a diagenetic replacement mechanism. Field studies as well as thin section and Scanning Electron Microscopic observations reveal that this volume-to-volume replacement is due to the interaction of mechanical and reactive deformation. Concentric

growth of silica, mainly in the form of megaquartz, and the ghost structures of the extinct apatite crystals suggest replacement of apatite by silica-rich pore waters. Presence of progressive steps of silica mineralization suggests that the process of silicification had depended on groundwater level fluctuations.