PETROGRAPHICAL AND GEOCHEMICAL CHARACTERISTICS OF SRI LANKAN MARBLES AND CARBONATITES: IMPLICATIONS FOR THEIR GENESIS AND ECONOMIC POTENTIAL

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The basement of Sri Lanka comprises extensive occurrences of Proterozoic marbles and comparably less occurrences of carbonatites. Hitherto, limited studies have been carried out on genesis, protoliths, economic potential and associated mineralizations of marbles. Equally, the crystallization process of carbonate minerals of carbonatites exposed at Eppawala has not yet been understood. This study attempts to interpret genesis of Sri Lankan marbles, their associated mineralizations and carbonatites. Similarly, economic potential of them also was investigated by introducing the value added products. Petrographical and geochemical characteristics of all the studied rocks were investigated using state of the art techniques. Preparation of Precipitated Calcium Carbonate (PCC) was carried out according to the Kraft pulping method.

The studied marbles are predominated by dolomite with minor calcite. Field relations as well as trace elemental and carbon isotope composition of carbonate fraction of them suggest that the protoliths of Sri Lankan marbles should be shallow marine dolostone. Presence of calcite rich zones along the contact margins of marbles indicates for the prevailed syn- to post-metamorphic fluid infiltrations in the crust. Field settings and geochemical characteristics of calcite deposits in Balangoda area reveal that they have been formed from melting of the host marbles. Presence of evidences for collision tectonics and post-metamorphic fluid fluxes are further confirmed that they have formed under crustal conditions. Vein-type mica deposits at Elahera are associated with meta-ultrabasite boudins in marbles. Rock textures and chemical data imply that the mineralization is due to infiltration of hydrothermal fluid through the contacts of meta-ultrabasite boudinage layer and marbles. The most likely source of hydrothermal fluid is exsolved fluid from nearby granitic pegmatites. Calcites of the Eppawala carbonatites occur as two different morphological types while dolomites occur as five morphological types. Results indicate that the type-1 dolomite and type-1 calcite are the oldest forms of carbonate minerals crystallized during the primary crystallization of magma. Type-2 and type-3 dolomites are the products of pervasive exsolusion of type-1 calcite. Type-4 and type-5 dolomites as well as type-2 calcite reflect the later recrystallization event. The exsolution and recrystallization processes are evidenced for the equilibration of carbonatite magma in to two crustal depths. The study demonstrated that there is a strong relationship between the textures of carbonate minerals with the experienced petrogenetic history of carbonatites.

The PCC synthesized from synthetic dolomite satisfy the industrial requirements giving high purity. Therefore, impure dolomitic marbles in the country could be used in the PCC industry. The synthesized PCC particles from the Eppawala carbonatites are in calcite polymorphic form with 96 to 98 wt % purity. Hence, the fresh carbonatites has great economic potential for the production of the PCC.