

KEY INDICATOR MINERALS AND CHEMISTRY FOR CARBONATITES: A REVIEW

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Abstract

Over the past 50 years, the study of carbonatites has been significantly increased due to their growing economic importance. Carbonatites are commonly significant repositories of economically valuable elements; however, the debate over the origin of carbonatites is still ongoing including the problem of distinguishing carbonatites from sedimentary carbonate rocks metamorphosed to marble. Minerals like calcite, apatite, phlogopite and magnetite are common in both carbonatite and marble; however the presence of pyrochlore can be a good indicator of carbonatite. But its absence cannot characterize marble. The presence of aluminous minerals like anorthite, scapolite or spinel is generally a reliable indicator of marble. In addition, the mineral assemblage of the rocks, trace elements analysis can supply critical high Sr and REE data including absence of europium anomaly, which usefully differentiate carbonatites from marbles. The MnO and SrO contents of carbonate minerals may be used as indicators to distinguish carbonatites from marble. For instance, MnO and SrO contents in carbonate minerals higher than 0.50 wt. % and 0.15 wt.%, respectively, are typical of carbonatites. Moreover, SrO content in carbonate minerals is a more sensitive indicator than MnO to distinguish carbonatite from sedimentary carbonate rocks metamorphosed to marble. The above mentioned characteristic factors are applied to the Leo-Shilman and Sellai Pattai carbonatite complexes in the Peshawar plain alkaline igneous province. Both of these complexes contain pyrochlore and their SrO content of carbonate minerals ranges from 0.74-3.94 wt.% and 0.12-1.55 wt.% in Leo-Shilman and Sellai Pattai, respectively, consistent with igneous origin for the carbonates of the carbonatites. In contrast, the Jambil carbonatites, however, lack such evidences, and require further study to determine their igneous or meta-sedimentary origin.