

Geochemical investigation for emerald mineralization in Lufwanyama district, Zambia

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This work presents a detailed geochemical study i.e. major, trace, and REE analyses of major rock types from various horizon in the Lufwanyama district (Kagem Mining Ltd). The rock samples of varying lithology were collected from four mines: Kamakanga, Libwente, and Chama pit. Quartz mica schist, talc-tremolite hosted schist, Talc mica schist, quartz tourmaline, mica schist, amphibolite schist, actinolite schist, pegmatite (quartz feldspar, quartz), etc., are the main lithology encountered in the study area. Samples were collected from the schist zone as well as the reaction zones. Total 109 samples were analyzed using multi acid digestion methods of ICP-MS and ICP-OES at (Shiva Laboratories, Bengaluru, India). SiO₂ and TiO₂ are the main constituents of major elements of the rocks. However, MgO is observed >20% in talc-mica schist with relatively low silica i.e. ~50% and enriched Fe₂O₃ (~10%) content. Similarly, Fe₂O₃ was found with enriched amount in talc-tremolite biotite schist and amphibolitic talc mica schist, and amphibolite schist. The high chromium content in talc mica schist has high range of 4668 ppm. The main source of Cr is from high magnesium metabasites. The enriched Cr content along with particular temperature and pressure is a favorable condition for emerald mineralization. Talc-tremolite-biotite-schist, talc-biotite-mica-chlorite-schist and Biotite-phlogopite-schist/reaction zone (QT) show enrichment of Be, Li, and Rb with higher K₂O concentration, indication a favorable evidence of emerald mineralization. Our geochemical study of the possible zone of emerald mineralization provides new information about the mineralization and the potential for new emerald occurrences in the Lufwanyama area. In this paper we describe the various reaction mechanisms of emerald mineralization based on the geochemical data recorded from 98 rock samples of various lithologies.