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Emplacement and Evolution History of Pegmatites and Hydrothermal Deposits, Matale District, Sri Lanka

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ABSTRACT

Excellent outcrops in Matale Sri Lanka provide unique insight into the emplacement and evolution history of hydrothermal and pegmatitic rocks in the central highlands of Sri Lanka. Field, structural, petrological, thermo-barometric studies in the metamorphic basement rocks in the central highlands and related hydrothermal deposits are presented in this study. Detailed petrographic and mineralogical data reveal peak metamorphic conditions for the crustal unit in the study area as $854 \pm 44^{\circ}\text{C}$ at 10.83 ± 0.86 kbar. Hydrothermal veins consisting of quartz and mica are closely related to cross-cutting pegmatites, which significantly post-date the peak metamorphic conditions of the crustal unit. Field relations indicate that the veins originated as ductile-brittle fractures have subsequently sealed by pegmatites and hydrothermal crystallization. Geological, textural and mineralogical data suggest that most enriched hydrothermal veins have evolved from a fractionated granitic melt progressively enriched in H_2O , F, etc. Quartz, K-feldspar, mica, tourmaline, fluorite and topaz bear evidence of multistage crystallization that alternated with episodes of resorption. It was suggested that the level of emplacement of pegmatites of the Matale District was middle crust, near the crustal scale brittle-ductile transition zone at a temperature of about 600°C . For this crustal level and temperature range, it is considered very unlikely that intruding pegmatitic melts followed pre-existing cracks. As such the emplacement temperatures of the pegmatites could be well below the peak metamorphic estimates in the mafic granulites. The metamorphic P-T strategy and position of formation of hydrothermal deposits and pegmatites is summarized in the modified P-T-t-D diagrams.

KEYWORDS

Hydrothermal veins, Pegmatites, Emplacement history, brittle deformation, Sri Lanka

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