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## **Geochemistry and tectonic settings of metavolcanics of Chitradurga schist belt, Karnataka, India**

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Primary volcanic features like pillow, vesicle, amygdale, variolite are prominent in the metavolcanics of lower Ingaldhal and upper Hiriya Formation of Chitradurga Group of 2.7 Ga to 2.6 Ga Dharwar Supergroup and offer favourable setting for study of volcanism associated with Archaean Greenstone belt. Ingaldhal Formation represents several individual volcanic cycles. Volcanics of Hiriya Formation are mainly andesitic to basaltic and associated with pyroclastics and minor felsic volcanics. Metavolcanics are interbanded with greywackes and metasediments. Association of variolitic basalt, rhyolite and basaltic andesite has indicated a probable bimodal volcanism. Basic volcanics of Chitradurga Group are essentially low-K tholeiitic basalts and basaltic andesites with enriched transition elements and are not significantly fractionated [2]. True andesites are rarely reported [1]. Tectonic settings proposed for the basic volcanics include intra-oceanic arc, island arc, continental margin and back-arc. Presence of slab melting related adakites [3] and spatially associated mantle wedge melting related tholeiites from many mafic-felsic successions of the Dharwar Supergroup have attributed them to island arc or continental margin settings.

In the present study, four types of basic, three types of felsic and two types of intermediate volcanics are identified in Chitradurga metavolcanics based on detailed geochemical studies of relatively immobile elemental ratio Nb/Y, Zr/TiO<sub>2</sub> [4] and Cr/Al<sub>2</sub>O<sub>3</sub>, and chondrite normalized REE pattern [5]. In both the formations, volcanism is bimodal with minor proportion of intermediate volcanic rocks. The predominant basic metavolcanic is sub-alkaline high-Mg tholeiitic metabasalt with flat REE. Sub-alkaline to calc-alkaline rhyolite/rhyodacite with very pronounced negative Eu anomaly, flat HREE and variable LREE enrichment is predominant in felsic metavolcanic. Sub-alkaline tholeiitic to calc-alkaline basaltic andesite to andesite with flat HREE and variable LREE enrichment occurs in minor proportions. There is minor variation in the metavolcanics from these two formations. Basic metavolcanics with flat HREE and low LREE occurs only in Hiriya Formation. The lower Ingaldhal Formation shows more variability with presence of both basic and acidic volcanic with relative enrichment of LREE. The predominant basic metavolcanics falls in MORB/EMORB and IAT field in various tectonic discrimination diagrams. Its flat REE pattern, HFSE (high Y) and LILE abundances is comparable with EMORB except for enriched values of Th, U, Pb and Cs. Its Sm/Yb vs La/Sm characteristics [6] are suggestive of partial melting of garnet lherzolite. Crustal contaminations with enriched LILE and depleted Nb are common. This points to a local extensional environment in subduction related back arc tectonic setting. The other variants of basic, intermediate and felsic metavolcanics represent localised environment in view of their different REE characteristics.

Hiriya and Ingaldhal metavolcanics represent separate episode and follows different fractionation trends. Starting from flat REE pattern in basic volcanics, LREE are enriched in the older Ingaldhal and depleted in younger Hiriya basic volcanics.

Figure-1. Chondrite normalised spider plots for metavolcanics of Ingaldhal and Hiriyur Formations.

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