

Trace, REE and Nd isotopic composition of OFB type Archaean mafic-ultramafic schists from Sandur schist belt, India

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A twenty two km wide horizon of mafic ultramafic sequence i.e. Sultanpura Volcanic Block (SVB) of Sandur schist belt is bounded by two accretion planes on its east and west. This volcanic block consists of pillowed high Mg basalts and ultramafic schists of komatiitic composition. They are interlayered with sulfidic BIF and pelagic sediments. Platformal terrigenous sediments are found on the other sides of the accretionary planes, but are absent within the SVB. They exhibit flat REE patterns with La/Yb between 1 to 2 with Σ REE about 10-20 times of chondrite. Fairly pronounced enrichment is seen in the incompatible elements. Ratios such as Nb/Ta, Nb/Zr and Nb/La are close to those of OFB. Similar ϵ_{Nd} resembles to 2.7 Ga CHUR. Eight point Sm/Nd isochron indicate emplacement age of 2706 ± 79 Ma. SHRIMP U/Pb ages of the zircons from the acid volcanics of the eastern accretionary shelf assemblage are found at 2658 ± 14 Ma and 2691 ± 18 Ma.

Geochemical and isotopic data of these volcanic rocks suggest that they were generated from a fertile, unfractionated and heterogeneous mantle. The unfractionated mantle was tapped at the Archaean ridge directly between the two continental nuclei or enriched magma was fed to the ridge from nearby hotspots. It is proposed that a small volume; 15-20% (upto 150 kms depth) of the mantle was depleted by 2.7 Ga. The melting of the enriched mantle below 150 km was common during late Archaean and this produced enriched oceanic crust distinct from MORB at the spreading ridges and also at and around hotspots. This explains the geochemical and isotopic characteristics of the metavolcanic (mafic-ultramafic) rocks of the Archaean greenstone belts.