

**Metasomatism of Indian Ocean MOR mantle:
evidences from geochemical signatures of Carlsberg
Ridge basalts**

SIMONTINI SENSARMA*¹, ABHISHEK SAHA¹, ARGHYA
HAZRA¹

¹ CSIR-National Institute of Oceanography, Dona Paula, Goa -
403004, India; (*correspondence:
simontinisensarma@gmail.com)

The global networks of mid-oceanic ridge-rift (MOR) systems across world's oceans represent potential sites of juvenile oceanic crust generation at intra-oceanic spreading centres. Mid-Oceanic Ridge Basalts (MORBs) origin from adiabatic upwelling and decompression melting of refractory upper mantle, in response to oceanic plate divergence. However, MORBs including their normal, enriched and plume varieties represent best geochemical sampling of upper mantle and its heterogeneity due to melt extraction, recycling, metasomatism and convective mantle stirring. The geochemical heterogeneity of Indian MORB mantle has been attributed to enrichment of "normal" depleted mantle by (i) recycled oceanic crust plus pelagic sediments, (ii) mantle plumes and/or (iii) delaminated sub-continental lithosphere. The studied Carlsberg Ridge Basalts (CRB) from Indian Ocean are tholeiitic in composition showing distinct enrichment in selective incompatible trace elements. LREE/MREE, LREE/HREE and MREE/HREE ratios attest to high degree, shallow level partial melting of a spinel peridotite mantle source. Higher values of Zr/Hf (33.8-47.3) and Zr/Sm (24.9-36.4) in conjunction with lower Nb/Ta (1.7-7.3) ratio for CRB with respect to primitive mantle compositions (Zr/Hf: 36, Zr/Sm: 25, Nb/Ta: 17.4) corroborate their origin from an enriched mantle source. Negative Nb anomalies with lower Nb/Y (0.04-0.11) and Zr/Y (2.5-3.5) discard the role of a mantle plume. This contention is further substantiated by higher Zr/Nb (25.5-71.5) and Th/Nb (0.6-0.42) compared to OIB (Zr/Nb:5.8; Th/Nb: 0.08) deciphering the role of a subduction modified mantle component in the source. Lower Nb/U (6.2-37.9) values with higher Ba/Nb (6.1-21.9), and Ba/Th (27.7-147.5; avg. 103.9) compared to OIB (Nb/U: 47.1, Ba/Th: 87.5 Ba/Nb: 7.3) and N-MORB (Nb/U: 49.6, Ba/Th: 52.5, Ba/Nb: 2.7) suggest derivation of CRB from a geochemically heterogeneous, enriched mantle source that experienced metasomatism by recycled oceanic crust and pelagic sediments from ancient subduction events. This distinct subduction imprint in the source mantle for CRB suggest modification and metasomatism of Indian MORB mantle by recycling of ancient subduction components that possibly genetically linked to (i) 1.5 Ga altered oceanic crust with pelagic sediments^[1] and (ii) Paleozoic-Mesozoic convergent margin processes off the east coast of Gondwana that recycled into the upper mantle beneath Gondwana and contributed to the compositional heterogeneity of Indian MORB mantle following the Gondwana Supercontinent break-up^[2].

^[1] Rehkämper & Hofmann (2007). Earth and Planetary Science Letters, 147, 93-106.

^[2] Kempton & Pearce (2003). EGS - AGU - EUG Joint Assembly, France. abstract id.4017.