Trace Element Modelling of Pelite-Derived Crustal Melts (Zanskar, North India)

TALK

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The anatectic migmatites and leucogranites of the High Himalayan Crystallines (HHC) south of the Zanskar Normal Fault (ZNF) provide an excellent opportunity to test crustal melting models. Isotopic analyses of Himalayan leucogranites from other regions have shown that they are the product of crustal melting and that their source rock most likely consisted of the metapelites and metapsammites exposed in the HHC or lateral equivalent[1]. The cause of melting has been variably assigned to frictional heating along the Main Central Thrust (MCT) with or without the interaction of fluids[2], hot over cold thrusting along the MCT[3] or decompression melting as a result of rapid uplift along the ZNF (or lateral equivalent) in conjunction with rapid erosional unroofing. These possibilities can be distinguished by detailed field studies integrated with analytical geochemistry. Preliminary field work in Zanskar clearly indicates the importance of the ZNF in controlling the emplacement of some leucogranites though its significance in determining the melting process remains equivocal.

Preliminary whole-rock major element and trace element X-ray diffraction data obtained for eight leucogranites from the Zanskar region have been used to test crustal melting models. The trace elements Rb, Ba and Sr are of particular use in modelling the processes involved during the melting of a pelitic source since they are all thought to reside predominantly in major phases. Three types of incongruent melting reactions are thought to occur at the onset of melting for a pelitic source :-

1) Vapour-absent melting of muscovite.

2) Vapour-present melting of muscovite.

3) Vapour-absent melting of biotite.

The results obtained for the Zanskar leucogranites indicate that vapour-absent melting of muscovite was the predominant melting reaction. This result is in agreement with data tested in the melting model for other Himalayan leucogranites[4].

This study aims to further our understanding of the melting processes involved by analysing the distribution of trace elements and rare earth elements between leucosome phases (in-situ granitic melts) and melanosome phases (restitic selvedge) of anatectic migmatites, and leucogranite bodies (e.g. Gumburanjun, E Zanskar) which have migrated from their source. It is hoped that these data can be combined with PT estimates to ascertain whether the melting style (i.e. equilibrium versus disequilibrium) varied with depth and temperature.

References
1 Deniel et al. 1985 Terra Cognita 5:292
2 England et al. 1992 J of Geoph Res 97, B2
3 Le Fort 1975, 1981
4 Inger S. 1991 unpublished thesis

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