Tibetan Chromitites: Digging in the Slab Graveyard

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Highly reduced UHP trace-mineral assemblages in podiform chromitite bodies in the Luobusa peridotite massif of SE Tibet, imply crystallisation in the Transition Zone, but most other features are similar to those of typical ophiolitic chromitites formed at shallower levels. New geochronological data may explain this apparent paradox.

Re-depletion model ages of laurite grains, and U-Pb ages and εHf values of euhedral zircons separated from massive chromitite, suggest that the chromitites formed at least 325 Ma ago; the trace-element signatures indicate crystallisation in a supra-subduction zone environment. A lithospheric mantle slab containing the chromitite was then subducted to the Transition Zone (>12.5 GPa), where the chromite inverted to the high-pressure polymorph Ca-ferrite, and reacted locally with reducing fluids to form the highly reduced trace-mineral assemblages. Os model ages (T_{RD}) of Os-Ir alloy nuggets in chromitites suggest that this had occurred by ca 235 Ma [1].

After ≥100 Ma in the Transition Zone, material from the buoyant, depleted slab was transported to shallow depths and incorporated into the lithosphere. Geodynamic modelling suggests this rise from >440 km was rapid (ca 6-8 Ma) and driven by rollback of the Indian slab. This process may occur in other collision zones; if so, mantle samples from the Transition Zone may be more widespread than previously recognised.

[1] Shi, R., *et al* (2007) **261**, 33-48