European Mineralogical Conference
Vol. 1, EMC2012-90, 2012
European Mineralogical Conference 2012

The tectonothermal evolution of the Tso Morari massif; petrography and geochronology of a mafic eclogite.

R.M. Palin (1), M. St-Onge (2), N. Rayner (2), M.P. Searle (1), and D.J. Waters (1)

(1) Oxford University, Oxford, United Kingdom (richard.palin@earth.ox.ac.uk), (2) Geological Survey of Canada, Ottawa, Ontario, Canada

Petrographic analysis of a sample of mafic eclogite from the Tso Morari massif, Ladakh Himalaya, has provided new and detailed insight into the tectonic evolution of the Indian margin immediately preceding the India-Asia collision. Integrated P–T pseudosection construction in the Na_2O–CaO–K_2O–FeO–MgO–Al_2O_3–SiO_2–H_2O–TiO_2–Fe_2O_3 (NCKFMASHTO) system using THERMOCALC and *in-situ* SHRIMP U-Pb zircon geochronology has provided tight constraints upon the timing and conditions of multiple stages of the tectonic evolution of the massif. A calculated prograde P–T path, obtained through analysis of garnet compositional zoning profiles, satisfies numerous microstructural and petrographic constraints observed in thin section. Poikiloblastic garnet cores document (M1) P–T conditions of 21.5 kbar and 535 ˚C during early subduction, occurring no earlier than 58.0 ± 2.2 Ma. Peak UHP (M2) conditions are constrained at 27-28 kbar and 645 ˚C using an assemblage of garnet (rim)–omphacite–rutile–phengite–quartz suggesting subduction to a maximum depth of ∼100 km. Analysis of zircon located within the matrix and as inclusions within garnet rims suggests that peak metamorphism occurred at 50.8 ± 1.4 Ma. This data suggests that the tectonic evolution of eclogite bodies within the Tso Morari massif exhibits similarities to that reported from Kaghan, North Pakistan Himalaya, ∼455 km to the west-northwest with the notable exception of timing of UHP metamorphism. Furthermore, the well-constrained calculated P–T–t history presented in this study (including constraints derived from the host Puga gneiss) is incompatible with reports of microdiamonds within similar eclogite samples at Tso Morari that would require subduction to P–T conditions of >39 kbar and >750˚C (Mukherjee & Sachan, 2004).