

Petrology of the Nidar mantle rocks (Ladakh, India): Petrology of a chromite-bearing fore-arc mantle section

Contact persons: Prof. Othmar Müntener and Prof. Jean-Luc Epard

Context

The Nidar ophiolite is part of the Tibetan – Indian ophiolites close to the Indus Tsango suture zone and related to the subduction of an ocean separating India and Asia. These ophiolites are generally considered to be formed in a fore-arc position, may be exhumed to the seafloor by detachment tectonics. The Nidar ophiolite has recently been studied for fluid inclusions where hydrogen, methane and diamond has been detected, which was used to infer that the Nidar ophiolite has an ultradeep mantle origin. The petrology of the harzburgites and dunites, and associated chromitites are less well studied and might be used to test the hypothesis of ultradeep origin. A series of samples from the batholith collected in 2014-2016, during a recent PhD by Nicolas Buchs provide the basic material for this study. The mantle rocks and in particular its mineralogy and alteration have never been studied in detail. The study of these mantle rocks will provide the basic data for a better understanding of the mantle lithosphere on which the Nidar (and other Himalayan ophiolites) are built.

Objectives and Methods

Analyses of peridotite and their minerals will be coupled with careful petrography and various analytical techniques to help gain a detailed understanding of the formation conditions of the Nidar ultramafic rocks. Analyses of thin and thick sections may be done using the whole suite of facilities available, such as Laser Ablation ICP-MS, Electron Probe Microanalysis, Scanning electron microscopy EBSD, SIMS, Raman spectroscopy, C-isotopes, and Fourier Transform Infrared Spectroscopy (Uni. Bern). The aims will be 1) to test whether the petrology indeed indicates ultradeep origin and 2) to use inclusions to test whether there is diamond, and whether it is of shallow or deep origin and how and why low temperature fluids interacted with the peridotite. This project will suit a student who appreciates the learning of various techniques and built upon the excellent existing field data.

Literature

Das et al. (2017) : In-situ peridotitic diamond in Indus ophiolite sourced from hydrocarbon fluid in the mantle transition zone. *Geology* 45/8 755-758
 Das et al. (2015) Peridotitic minerals of the Nidar ophiolite in the NW Himalaya: sourced from the depth of the mantle transition zone and above. *Geol Soc London, Spec publ* 412, 271-286
 Pearson, N.J., Satsukawa, T., Shi, R., Williams, P., Xiong, Q., Yang, J-S., Zhang, M., O'Reilly, S.Y. (2016b) Mantle Recycling: Transition-Zone metamorphism of Tibetan ophiolitic peridotites and its tectonic implications. *Journal of Petrology* 57, 655-684.

Chromitites in the Nidar dunites



Sites WEB

<http://www.unil.ch/geoleman/home/menuinst/memoires/memoire-de-master---sujets-r.html>

Choice of orientation :

Orientation GATO (Geochemistry, Alpine tectonics, Ore Deposits):