Sobolev Institute of Geology and Mineralogy SB RAS (IGM SB RAS)
Trofimuk Institute of Petroleum Geology and Geophysics SB RAS (IPGG SB RAS)
Novosibirsk State University (NSU)

8th INTERNATIONAL SIBERIAN EARLY CAREER GEOSCIENTISTS CONFERENCE

13-24 June 2016

PROCEEDINGS OF THE CONFERENCE

Novosibirsk 2016

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EVOLUTION OF TEMPERATURE REGIME OF PLASTIC DEFORMATION MANTLE PERIDOTITES

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Mantle peridotite, ophiolitic complex, dunite, harzburgite, plastic deformations, temperature regime

Mantle peridotites from ophiolite complexes of northeastern Baikal region are intensely plastically deformed [1]. For them found three heat settings of plastic deformations (Fig. 1). First, the most high-temperature regime (more 800°C) identified in dunites and harzburgites with equilibrium, medium-coarse-grained, granoblastic microstructure in which plastic deformations implemented mainly intragranular translation slip systems in olivine: {0kl}[100], (010)[100]. Plastic flow of ultramafics occurred obviously in mode of axial compression, low speed ($\varepsilon<10^{-6}$ c^{-1}) in the conditions of the upper mantle.

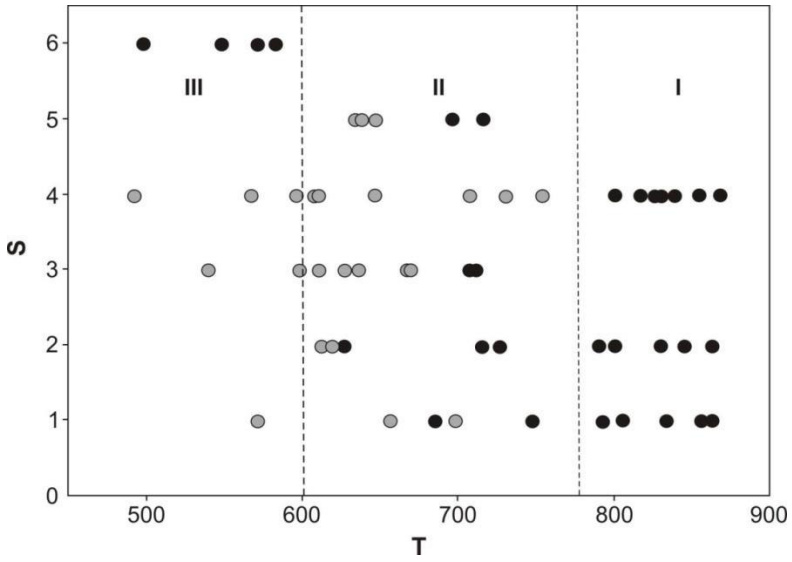

Fig.1 – Dependence of temperature of olivine-chromitic equilibria (T°, Celsius) from degree of deformation of dunites and harzburgites (S). I-III – modes of plastic deformations: I – high-, II – medium-, III – low temperature. Massifs: Paramsky (black circles), Shamansky (gray circles)

The second medium temperature regime (600-800°C) is the most typical of dunites and harzburgites with porfiroclastic types of microstructures. Plastic deformations of olivine occurred by translational sliding with the change of systems with high-temperature on low-temperature: {0kl}[100], (110)[001], (100)[010], as well as by sintectonic recrystallization and cataclastic flow. Plastic flow of ultramafics realized in terms as both axial as shear intense deformations at a significant rate ($\varepsilon>10^{-4}c^{-1}$) in the process of moving ultramafics in crust.

The third low-temperature mode (500-600°C effect of gabbro intrusions on consolidated ultramafics. As a result, ultramafics are exposed a process of secondary recrystallization annealing with the formation of dunites with micro-grained microstructure, without signs of plastic deformation of olivine.

Thus, the identified temperature regimes reflect the regressive direction metamorphism of ultramafics of ophiolite association in the process of moving from upper mantle to crust, which are caused by plastic deformation of olivine by mechanisms of translational slip, sintectonic recrystallization and subsequent secondary recrystallization annealing.

References:

1. Chernyshov A.I. (2005): Petrostructural signature of olivines in ultramafic rocks of the Paramsky and Shamansky massifs (Baikal-Muya ophiolite belt) // Russian Geology and Geophysics. V. 46(11). P. 1121–1132