Age and matter sources of ophiolites of the Kuznetsk Alatau, SW Siberia: New Sm-Nd isotope data

I.F. GERTNER[1]*, T.B.BAYANOVA[2], T.S. KRASNOVA[1], N.A. DUGAROVA[1], V.V. VRUBLEVSKII[1] AND G.R. SAYADYAN[3]

[1]Tomsk State University, Russia (*labspm@ggf.tsu.ru)
[2]Cola Science center of RAS, Apatity, Russia
[3]Far East Geological Institute of RAS, Vladivostok, Russia

Ophiolites of the Kuznetsky Alatau Ridge are an ancient suture zone formed as a result of the collision of few arc island terrains on the active margin of Siberian continent during the Late Cambrian time (~500 Ma). One of typical ophiolite fragments of this region is the association of ultrabasic and basic rocks of the Barkhatnaya, Zayachiya, Severnaya, and Zelenaya mountain apexes. It is an arc-like structure, where ultrabasites are in the rims and basites are in the core. According to regional geological conclusions, the temporal range of ophiolite forming is from Early Cambrian to Late Riphean time. Our new data of Sm and Nd isotopes for the whole rocks of mantle hyperbasites and ultramafic-mafic rocks are close to the most ancient time of these rocks.

The Sm-Nd isochron based on the four whole rock samples of harzburgite, chromitite and dunite (from the Barchatnaya apex) has a slope corresponding to the age 950±59 Ma at MSWD = 0.968 and εNd (T) = +9,5. The 7-point regression line based on the whole rocks magmatic peridotites and gabbroides of toleitic series is demostrated the closed temporal interval. Its slope corresponds to the age 937±50 Ma at MSWD = 0.966 and εNd (T) = +7,8. The restitic ultrabasites of the Barkhatnaya apex correspond to the characteristics of the strongly depleted backarc basin -type mantle substrate whereas magmatic rocks of internal part are similar to MOR-type crust. Rocks of dike-type complex from the Barkhatnaya apex have a more young age of formation and metamorphism. The slope of Sm-Nd isochron based on the two whole rock samples and two mineral separates of diabasites corresponds to the age 679±34 Ma at MSWD = 1.86 and εNd (T) = +8,2. Harzburgites of the Severnaya and Zelenaya apexes are characterized a wide diapason of Nd-isotope ratios that show a contamination of mantle substrate by crust fluid matter during the recrystalization of these obuction in upper crust. Acording to the rate of syntectonic recrystalization of rocks the range of εNd (T) parameters are changed from +7.96 to -6.51.

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On the origins of Platinum-Group Minerals in ophiolitic chromitites

*F. GERVILLA[1], W.L. GRIFFIN[2], J.M. GONZÁLEZ-JIMÉNEZ[2], J.A. PROENZA[3], SUZANNE.Y. O'REILLY[2] AND N. J. PEARSON[2]

[1]Dpt. Mineralogy & Petrology (UGR-IACT), Granada, Spain (*correspndence: gervilla@ugr.es)
[2]GEMOC ARC National Key Centre, Sydney, Australia. bill.griffin@mq.edu.au; jose.gonzalez@mq.edu.au; sue.oreilly@mq.edu.au; norman.pearson@mq.edu.au
[3]Dpt. Cristallography, Mineralogy & Mineral Deposits (UB), Barcelona, Spain (japroenza@ub.edu)

Platinum-Group Minerals (PGM) commonly occur as solid inclusions in chromitites hosted in the mantle section or the mantle-crust transition of ophiolite complexes. The most widely accepted idea is that PGMs now encased in larger chromite crystals precipitated from melts and were later mechanically trapped by growing chromite. This hypothesis, traditionally accepted by many authors, has been sustained until now on the basis of morphological features of the PGMs in the chromitites. This approach does not provide a satisfactory explanation for the PGMs beyond determining *empirically* the T-fS_2 conditions for their crystallisation from the melts that also precipitated the host chromitite. The key question of how the PGMs form and why they are found in the chromitite remains unresolved.

A major breakthrough in our understanding of the relationships between the chromitites and their enclosed PGM has come in the last few years, through new experimental data and the *in situ* analysis of Os isotopes by laser-ablation ICPMS analysis [1] Integration of these advances, a re-interpretation of the microstructures and the Os-isotope analyses of individual PGMs suggest several different origins for the PGMs in chromitites: (1) most suites of PGMs mainly record crystallisation during mixing of multiple batches of isotopically distinct melts, followed by physical entrapment in chromite; (2) some PGMs in chromitites may have been scavenged from wall-rock peridotites during migration of the parental melts of the chromitites through the mantle; (3) other platinum-group minerals may have precipitated from metasomatic fluid and/or melts that infiltrated existing chromitites. All of these processes may be required to explain the presence in the chromitites of micrometric PGMs with distinct Os-isotope compositions.

[1] González-Jiménez *et al* (2012). *Chemical Geology* **291**, 224-235.

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