



Interpretation of PGE distribution into the olivines and sulfides of sheared peridotites of the Udachnaya kimberlite pipe (Yakutia).

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The sheared peridotites from the Udachnaya kimberlite pipe are the unique material for investigation. They represent a root part (180-230 km) of the lithospheric mantle of the Siberian craton [1, 2] and are unusually fresh with rare or without any secondary alterations. The sheared peridotites are composed of porphyroclasts of olivine, orthopyroxene, clinopyroxene and garnet located in fine-grained (less than 0,1-0,2 mm) neoblasts matrix of olivine with minor orthopyroxene and clinopyroxene. Equilibration temperatures and pressures for Udachnaya sheared peridotites are 1250-1400°C and 5,7 – 7 GPa [3]. Investigation of platinum group elements (PGE) fractionation in deepest seated rocks can help us to understand what mantle processes are involved in accumulation or depletion of PGE. We report PGE concentrations in the olivine, sulfides and whole rock of the sheared peridotites. Also, we measured PGE content in jewelry pure olivine to compare it with olivine from xenoliths.

The sheared peridotites have negative correlation between Os, Ir and (Al₂O₃+CaO). It means that as a result of mantle metasomatism, an increase in the amounts of garnet and clinopyroxene in the composition of the sheared peridotites is accompanied by the depletion of Os, Ir contents. The correlation between Pt, Pd and (Al₂O₃+CaO) is weak. It turns out that the enrichment of Pt and Pd did not occur due to the silicate metasomatic enrichment.

It is believed that the contribution of PGE to mantle rocks is made by sulfides [4]. The sulfides are characterized by PGE distribution within 1-10 PGE chondrite-normalized pattern. The sheared peridotite PGE concentrations have a narrow range from Os to Pt being within 0,01 chondritic units on chondrite-normalized pattern of whole rock PGE content. And they have a broad range of Pd, Re concentrations that are from 0,0001 to 0,01 chondritic units. PGE concentration in olivine from the sheared peridotites are within 0,001 chondritic units. PGE content in pure olivine varies from 0,00001 to 0,0001 chondritic units. Thus, PGE contribution to the whole rock peridotite composition are from olivine and sulfides.

PGE pattern shape in Rh-Pt and Pd-Re segments of sulfides and whole rock of sheared peridotites are similar. Therefore, it can be noted that Rh, Pt, Pd and Re contribution in rocks is mostly due to sulfide phases. The olivine influence on PGE distribution in sheared peridotites is also noticeable. In these rocks olivine makes up 60% of the total mass and is the important concentrator of PGE. Pure jewelry olivine is characterized by enrichment in Pd and Re in contrast with Ir, Ru, Rh and Pt. Olivine from sheared peridotites have smooth spectra of all PGE, with peak on Ru in one case.

Since the combination is complex, it is impossible to say clearly which contribution of PGE (sulfides or olivines) is greater.

References

1. Pokhilenko et al., 1999
2. Agashev et al., 2013
3. Brey, Kohler, 1990
4. Mungall et.al., 2014