Zinc isotope constraint on the petrogenesis of Fe-rich peridotites and pyroxenites of the Bohemian Massif

Jian Huang[1], Lukáš Ackerman[2], Fang Huang[1]

[1]School of Earth and Space Sciences, University of Science and Technology of China, Hefei, China.
[2]Institute of Geology, The Czech Academy of Sciences, Praha,
Czech Republic.

Zinc isotope compositions of mafic-ultramafic rocks show limited variations during partial meltng[1,2] but significant diversity during mantle metasomatism[2,3], indicating that Zn isotopes may be a sensitive tracer of metasomatic processes in the mantle and in turn, provide constaints to petrogenesis of manlte-derived rocks. Mantle-derived peridotites and pyroxenites are common in several tectonostratigraphic units of the Bohemian Massif (Czech Republic) and their petrogenesis is a matter of debate[4,5]. Here, we present high-precision Zn elemental and isotopic analyses of a suite of Mg-rich and Fe-rich peridotites as well as associated pyroxenites from the Moldanubian Zone of the Bohemian massif in order to constrain the petrogenesis of these mantle-derived rocks.

Our results show that the Mg-rich peridotites have homogeneous Zn isotopic compositions with $\delta^{66}Zn$ of 0.15 ± 0.09‰ (2SD), similar to that of the primitive mantle[1]. In constrast, the Fe-rich peridotites have resolvably higher Zn contents and $\delta^{66}Zn$ values (0.11 to 0.41‰). The pyroxenites show the largest variations of $\delta^{66}Zn$ values from -0.33 to 0.42‰. However, except for three pyroxenites with higher $\delta^{66}Zn$ values, the others have Zn contents and $\delta^{66}Zn$ values similar to or lower than those of the Mg-rich peridotites. Such compositions of pyroxenites are complementary to those of the Fe-rich peridotites. Thus, our Zn isotopic data indicates that the Fe-rich peridotites were produced by melt-rock interactions between the Mg-rich peridotites and slab-derived basaltic melts with a heavy Zn isotopic signature, while the pyroxenites represent the crystallized products of residual melts[4].

[1] Sossi et al. (2018, CG): 477, 73–84; [2] Huang et al. (2018, JGR, Accepted); [3] Wang et al. (2017, GCA): 198, 151–167; [4] Ackerman et al. (2009, Lithos): 259, 152-167; [5] Svojtka et al. (2016, JP): 57, 897–920.