The PGE and Os isotope variations of the mantle derived rocks from the ICDP Cores of the Oman Drilling Project at the Samail Ophiolite, Oman

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On the Earth, the oceanic plates are formed at mid-ocean ridges and subducted into the mantle at convergent plate margins. This planetary process returns substantial surfacial materials to Earth’s interior contributing to a global recycling system. Therefore, understanding of the characteristics of between the lower oceanic crust and the underlying upper mantle and their relationships remains poor. Much of our knowledge of the construction processes of the lower oceanic crusts comes from of ophiolites; ancient blocks of oceanic lithosphere exposed on land. To generate better understanding of the oceanic crust and uppermost mantle, the Oman Drilling Project collected a suit of diamond-coded boreholes from the Samail ophiolite Oman, the world’s largest sequence of upper oceanic lithosphere exposed on land, during 2016 to 2018. The drill sites were located in the four areas with different stratiphy, Gabbro Transect (GT) sites, Crust-Mantle Transition (CM) sites, Active Alteration (BA) Sites, and Basal Thrust (BT) sites.

We focused on the lower crustal rocks and upper mantle peridotites from the GT, BA and CM sites. The GT site is located at the southward from a divide near the crust-mantle transition zone. Our samples are from the cores of the GT site which are the intact sections of lower crust, capturing the sheeted dyke - gabbro transition (GT3), middle (foliated) gabbros (GT2) and lower (layered) gabbros (GT1). The BA site is in the mantle section and the active serpentinization and carbonatization of the mantle rocks can be observed on the surface. The CM site is the place of the crust-mantle transition beautifully exposed, with mantle harzburgites in the North transitioning to dunites then gabbros. The cores from the CM site are sampled from the crust-mantle transition zone in the Samail Ophiolite and our samples from the CM cores are from the both sides of the core-mantle boundary.
Here we report the preliminary results of the PGE abundances and Os isotope ratios from the lower crustal rocks and upper mantle peridotites and compare with the data obtained for the samples from the Oman outcrops. Similar PGE patterns of the drillcore derived gabbros and outcrop samples indicate that the PGE are resistant to the surficial weathering processes in Oman. The average of the age corrected Os isotope ratios in the drillcore gabbros (0.14) at 96 Ma shows clearly higher than the mantle Os isotope ratios at the same age (CHUR: 0.127 and PUM: 0.129). This means that the Os source of the gabbroic rocks of these cores was not only the mantle and possibly the addtion of the Os from the subducted material. These data will be help us to better understand the relationships between the oceanic crust and underlying upper mantle, mechanisms of making the oceanic crust, and to plan the future Mohole projects.

Keywords: Os isotope ratio, mantle peridotite, gabbro, ICDP Oman drilling project, Platinum group elements

