Platinum-group elements in the oceanic mantle beneath the Ontong Java Plateau

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The overabundance of highly siderophile elements including platinum-group elements (PGEs) and rhenium in the Earth's mantle, relative to predicted composition is often explained by the late-veneer model assuming the late influx of chondritic materials after core formation. Although the model is not universally accepted due to insufficient knowledge of metal-silicate partitioning under high-pressure and temperature conditions, broadly chondritic relative abundances of PGEs in mantle rocks are thought to be supportive of the addition of chondritic materials which were mixed within the silicate mantle after the efficient stripping of PGEs to the metallic core. However, recent studies demonstrate that PGE composition of the Earth's primitive mantle (PM) is characterized by suprachondritic Pd/Ir and Ru/Ir, and does not match the composition of any known chondrite. To date, most data for PM estimate have been obtained on subcontinental mantle (orogenic lherzolite massifs and xenoliths from basalts erupted on continents) due to relative rarity of fertile samples originated from suboceanic mantle (ophiolites and abyssal peridotites). This leads to the question of whether the non-chondritic PGE ratios for PM estimate are the result of biased sampling.

In this study, we present PGEs and Re abundances for a set of peridotite xenoliths from Malaita, Solomon Islands, which are regarded as fragments of oceanic lithosphere beneath the Early Cretaceous Ontong Java Plateau. Thermobarometric and petorologic evidence of the xenoliths reveal that they represent virtually the entire section of subplateau lithospheric mantle (Moho to 125 km), which is vertically stratified in compositional. A unique suite of garnet-lherzolites sampled from the deep lithosphere may provide the opportunity to test whether the undepleted suboceanic mantle also yields non-chondritic PGE ratios. An additional aim of this study is to examine whether relative fractionation of PGEs reflect primary mantle features, or they are related to recent melt extraction, mantle metasomatism, and secondary alteration. For these purposes, concentration variations of PGEs together with Re-Os isotope systematic have been investigated for sample covering whole range of P-T and lithology. We will discuss the possible causes of PGE variations in terms of the formation and evolution of the lithosphere, partly associated with the Ontong Java Plateau magmatism.