

# Precise and simple determination of trace platinum group elements in rock samples using isotope dilution ICP-MS

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Platinum group elements (PGEs) in mantle derived rocks have been used as the powerful tracers for discussing core-mantle interaction and / or genesis of sulfide ore deposits. However, there are only a few reports for PGE abundances in common basaltic systems. The concentrations of PGEs in basalts are extremely low and basaltic melts showing low degree of partial melting are generally considered to be sulfide saturated. Because of the highly compatible behavior of all PGEs during the differentiation of sulfide saturated melts, the PGE abundances in the original source melt or mantle cannot be readily estimated. However, Tatsumi et al. (1999, 2000) showed that the PGE abundances in some oceanic island basalts (OIBs) were not always affected by sulfide segregation during the magma differentiation. To demonstrate the various behaviors of PGEs among OIBs and provide consistent explanation for their systematics, we are now developing precise and simple analytical method for the determination of trace PGEs in basalt samples using inductively coupled plasma mass spectrometry (ICP-MS; Agilent 7500s).

So far, two major digestion techniques of rock samples have been reported for the purpose. One is the alkaline fusion such as Na<sub>2</sub>O<sub>2</sub> fusion or NiS fire assay. The other is the high pressure acid digestion in a closed glass tube such as Carius tube or HPA-S. In this study, we first tried to reproduce the NiS fire assay described in Oguri et al. (1999). However, rather high contamination originated from the blank was observed. In addition, the argides of Ni and Cu significantly interfered with the precise determination of PGEs. Hence, cation exchange was further applied to remove such interferents in the sample solution. In this case, external calibration method was replaced by the isotope dilution (ID) analysis. Although the analytical reproducibility was sufficient for the replicate analyses of BHVO-2, it was found that the analytical blank was still problematic for the analysis of basalts with low PGE abundances.

Therefore, Carius tube digestion with cation exchange chromatography is tried as the next step. However, the potential interferents in ICP-MS such as Zr, Mo, Hf and W are remained in the PGEs fraction and, hence, only external calibration method has been applicable (Jarvis et al. 1995; Ely et al, 1999) since ID-analysis needs at least two isotopes free from isobaric interferences. To apply ID analysis to the method, we are now examining the solvent extraction using n-phenyl-n-benzoyl hydroxyl amine (BPHA) to remove such interferents from the PGEs fraction. Considering that anion exchange procedure, which is popular chemical separation method of PGEs, needs the complicated elution scheme for individual PGE, our method may become simpler and faster analytical method to determine trace PGEs in rock samples.