Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9727

PGE geochemistry of the Macquarie Island basalts and picrites

GYUCHAN PARK[1], JUNG-WOO PARK[1] AND VADIM KAMENETSKY[2]

[1]Seoul National University
[2]Institute of Experimental Mineralogy
Presenting Author: qkrrbcks7@naver.com

Near-primitive and fractionated mid-ocean ridge basalts (MORB) and picrites containing early crystallized olivine phenocrysts occur in Macquarie Island, the emerged part of the Macquarie Ridge Complex. They show a wide range of compositional variations in incompatible trace element and elemental ratios caused by varying degrees of partial melting and magma differentiation. We investigated the PGE geochemistry and petrography of MORB glasses and picrites from Macquarie Island to constrain sulfide saturation history during the early stage of the MORB magma differentiation process. The PGE geochemistry of near-primitive MORB glass and picrite samples has no apparent correlation with trace element ratios controlled by the partial melting degree (e.g., La/Sm), suggesting its limited influence on PGE contents of the Macquarie primitive magma. All PGEs decrease with decreasing MgO in MORB glasses, showing compatible behavior from the early stage of magma differentiation. The positive inter-element correlation between PGE in MORB glasses and picrites suggests that they are mainly hosted by sulfide. It is consistent with sulfide inclusions in olivine phenocrysts with high Fo# (= 88 – 90) and interstitial sulfides between Cr-spinel, plagioclase, and clinopyroxene in picrites. Most sulfide grains are multi-phase, including chalcopyrite, pentlandite, and pyrrhotite, while some interstitial sulfides are dominantly composed of pyrrhotite. In-situ LA-ICP-MS analyses on sulfides in a picrite sample show that they contain highly variable PGE contents (total PGE = 2 ppb – 41 ppm). Most of them display fractionated PGE patterns (Pd/Ir = 11 - 18618), higher than those of MORB (Pd/Ir = 1.76 - 117), with strongly negative Pt and mildly negative Au anomalies, suggesting that other phases host Pt and Au. Time-resolved LA-ICP-MS spectra of some analyses show the occurrence of Au or Pt-rich inclusions (rarely, Au-Pt, Au-Ag-Pd, and Ir-Pt inclusions) in the sulfide grains.