PGE and Geochemistry of Wajilitag Ultramafic Cryptoexplosive Breccias from Tarim Large Igneous Province: Implications for Petrogenesis

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Wajilitag ultramafic cryptoexplosive breccias in Bachu area, as one of the most important rock types of the Tarim Permian large igneous province, were studied on platinum group elements (PGE), and major and trace elements. The breccias have Os, Ir, Ru, Rh, Pt and Pd contents of 0.36-1.08, 0.23-0.44, 0.29-0.92, 0.11-0.18, 1.88-3.16 and 1.39-3.52 ng/g respectively, which are lower than those of the primitive mantle and the picrites in the Emeishan large igneous province. The Pd/Ir ratios range from 3.6 to 11.9, and the PGE patterns display positive inclined curve, showing a certain extent of differentiation and having the PGE affinity of basic-ultrabasic rocks under within-plate environment. The relatively constant Cu/Pd ratios ($5.3\text{-}12.1\times10^4$) indicate that the breccias were derived from the sulfur-unsaturated magma. The positive correlations for IPGE vs. MgO and negative correlations for PPGE vs. MgO suggest the PGE differentiation was probably caused by differentiation of olivine. Geochemically, the breccias are very enriched in total REE amounts and have strong fractionation between LREE and HREE. On the primitive mantle normalized spider diagram, the breccias show humped distribution patterns, with LILE enrichment, slight depletion of Nb and Ta, and negative Zr and Hf anomalies, suggesting that the breccias may be undergone mantle metasomatism. However, mantle metasomatisms might be not the main factor to explain the PGE pattern, indicating that the PGE may exist in the sulphide inclusions of the breccias. The Os vs Ir trendline between the Wajilitag cryptoexplosive breccias of Tarim large igneous province and the picrites of Emeishan large igneous province in late Permian are almost the same, suggesting that they might be derived from a super plume.

This study was funded by National Key Project for Basic Research of China (No.

2007CB411303 and 2001CB409801).

References

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