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塔里木瓦吉里塔格超镁铁质隐爆角砾岩铂族元素和微量元素地球化学特征及其岩石成因探讨

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摘要:

本文对塔里木盆地二叠纪大火成岩省中瓦吉里塔格地区超镁铁质隐爆角砾岩进行了铂族元素(PGE)和主、微量及稀土元素分析和研究。结果显示, 隐爆角砾岩中Os、Ir、Ru、Rh、Pt和Pd含量分别为 $0.36 \times 10^{-9} \sim 1.08 \times 10^{-9}$ 、 $0.23 \times 10^{-9} \sim 0.44 \times 10^{-9}$ 、 $0.29 \times 10^{-9} \sim 0.92 \times 10^{-9}$ 、 $0.11 \times 10^{-9} \sim 0.18 \times 10^{-9}$ 、 $1.88 \times 10^{-9} \sim 3.16 \times 10^{-9}$ 和 $1.39 \times 10^{-9} \sim 3.52 \times 10^{-9}$ 均低于原始地幔, 与夏威夷苦橄岩相似。该岩石的Pd/Ir比值在3.6~11.9之间, PGE分配模式呈一条正倾斜的曲线, 表现出一定程度的分异, 具有非俯冲背景下产生的基性-超基性岩的PGE配分特点。略高于原始地幔但变化较小的Cu/Pd比值($5.1 \times 10^4 \sim 12.1 \times 10^4$)表明其岩浆在上升侵位过程中并没有发生明显的饱和硫化物熔离作用, 而岩浆源区在部分熔融过程中可能有少量残留的硫化物存在。隐爆角砾岩全岩的IPGE元素与MgO之间基本上呈正相关, 而PPGE元素与MgO之间则略成负相关或无明显相关性, 指示PGE的分异主要受到橄榄石结晶分异作用的控制。地球化学特征显示隐爆角砾岩的稀土元素总量高度富集($964.1 \times 10^{-6} \sim 1299 \times 10^{-6}$)和轻、重稀土强烈分馏($(La/Yb)_N = 45.88 \sim 64.90$), 且微量元素蛛网图上大离子亲石元素富集和Nb、Ta的轻微亏损以及Zr、Hf的明显贫化, 表明岩石可能遭受一定程度的地幔交代作用影响。但是, 角砾与胶结物具有相近的PGE特征表明交代作用对PGE的影响并不大, 暗示PGE可能主要赋存于禁锢在硅酸盐矿物内的硫化物包裹体中。

英文摘要:

Wajilitag ultramafic cryptoexplosive brecciated rocks, as one of the most important rock types of the Tarim Permian Large Igneous Province, were studied on platinum group elements (PGE), major, trace and rare earth elements in this study. The results show that these rocks have Os, Ir, Ru, Rh, Pt and Pd contents of $0.36 \times 10^{-9} \sim 1.08 \times 10^{-9}$, $0.23 \times 10^{-9} \sim 0.44 \times 10^{-9}$, $0.29 \times 10^{-9} \sim 0.92 \times 10^{-9}$, $0.11 \times 10^{-9} \sim 0.18 \times 10^{-9}$, $1.88 \times 10^{-9} \sim 3.16 \times 10^{-9}$ and $1.39 \times 10^{-9} \sim 3.52 \times 10^{-9}$ respectively, which are lower than those of the primitive mantle and can be compared with the Hawaiian picrites. The Pd/Ir ratios range from 3.6 to 11.9 and the PGE patterns take a shape of positive inclined curve, showing a trend of differentiation and a PGE affinity of basic-ultrabasic rocks under within-plate environment. Generally, the brecciated rocks have higher and concentrated Cu/Pd ratios ($5.1 \times 10^4 \sim 12.1 \times 10^4$) compared to the primitive mantle, indicating that no obvious sulfur oversaturation and segregation occurred during the magma upwelling, but the magma source may have some residual sulfide during its process of partial melting. The positive correlations for IPGE vs. MgO and negative correlations (or no obvious correlation) for PPGE vs. MgO suggest that the PGE differentiation was probably controlled by differentiation of olivine. Geochemically, the brecciated rocks are much enriched in total REE amounts ($964.1 \times 10^{-6} \sim 1299 \times 10^{-6}$) and have strong fractionation between LREE and HREE. On the primitive mantle normalized spidergram, the brecciated rocks show humped distribution patterns, with LILE enrichment, slight depletion of Nb and Ta, and negative Zr and Hf anomalies, suggesting that the rocks may have undergone mantle metasomatism. However, similar PGE patterns from the breccias and matrix show that mantle metasomatism might not be a main factor for the PGE fractionation of the brecciated rocks, indicating that the PGE may be existed in the sulphide inclusions in the silicate minerals.

关键词: [PGE特征](#) [地球化学特征](#) [岩石成因](#) [超镁铁质隐爆角砾岩](#) [瓦吉里塔格](#) [塔里木盆地](#)

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