Gold and PGE contents of lamprophyres in Jiaodong Peninsula: Insights into metal enrichment and release from the metasomatized mantle source for giant gold deposits

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Re-fertilized sub-continental lithospheric mantle (SCLM) is often thought to provide the gold-enriched source for overlying gold deposit provinces[1,2]. Giant gold deposits (> 5000 tons) formed around 130-120 Ma in Jiaodong Peninsula, and metasomatized SCLM has been assumed to contribute to the gold mineralization during almost coeval decratonization[3,4]. The gold contents of basalts derived from the metasomatized SCLM (erupted at 130-120Ma) suggest no noticeable enrichment of gold in the mantle source (<1-2 ppb) but may indicate efficient release of gold into primitive hydrous magmas[5]. However, these basalts are far from the Jiaodong Peninsula and so, given the possible spatial heterogeneity[6], may not adequately reflect the mantle source of the Jiaodong gold province in eastern NCC.

Volatile-rich lamprophyres occur widely in a close spatial-temporal relationship with gold deposits. In order to better understand the gold contents of metasomatized SCLM in Jiaodong Peninsula and the release efficiency of gold into melts, we determined gold and PGE contents of two episodes of lamprophyre dykes, which were emplaced before and after gold mineralization and display arc-like and OIB-like geochemical features, respectively[7,8]. Preliminary results indicate that the lamprophyres that formed before mineralization have 1-3 ng/g Au, higher than those (<1 ng/g) emplaced after mineralization. The results permit similar conclusions to those from the basalts: gold was not significantly enriched in the metasomatized mantle source but was extracted efficiently in melts, regardless of the degree of mantle melting. We thus conclude the mantle source must not necessarily be highly enriched in gold to form a giant gold province, whereas the release and transport of gold promoted by metasomatic volatile components may play a crucial role.

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