

Platinum group element mobilization in mantle caused by recycled sedimentary carbonate

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Platinum-group elements (PGE) in mantle are confined in sulfide, thus PGE mobilization and enrichment depend on the stabilization of mantle sulfide. The high concentration of PGE in melt has generally been thought to result from complete dissolution of sulfide in high-degree partial melts. Here we report on carbonatitic xenoliths carried by the Dalihu Neogene basalt, Inner Mongolia, China, showing that recycled sedimentary carbonate could greatly increase PGE mobility in mantle by transforming sulfide into sulfate. The carbonatitic xenoliths represent mantle recycled sedimentary carbonate since they show typical limestone-like trace element pattern and high $^{87}\text{Sr}/^{86}\text{Sr}$ ratio. However, they contain much high PGE content (~1000 times) than sedimentary carbonate. Moreover, sulfur isotopic compositions of carbonate associated sulfate in the carbonatitic xenolith ($\delta^{34}\text{S}_{\text{CAS}} = 9.6\text{-}10.2\text{‰}$) is lower than that of sedimentary carbonate ($\delta^{34}\text{S}_{\text{CAS}} = 25\text{-}35\text{‰}$). These observations highly suggest that mantle sulfide could be transformed into sulfate in the carbonatitic melt and release PGE out into melt, thus greatly increase the PGE mobility.