Some typical partition and distributition patterns of platinum group elements

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Some typical partition and distributition patterns of platinum group elements (PGEs) are noticed by the authors in the study on geochemical indicator system of PGEs. They can be taken as useful tools in solving diagenetic and metallogenic as well as other more extended geochemical problems.

Typical partition patterns and their significance

Partition patterns. There are three typical partition patterns. They are separately named as Ru–Pt pattern, Ru–Os pattern and Pt–Pd pattern. The Ru–Pt pattern is characterized in element concentration by Ru,Pt > Os,Ir,Rh,(Pd). In some cases, Pd may be slightly greater than Ru, but, among relatively inertial elements Os, Ru, Rh and Ir , Ru is obviously more enriched . The platinum group elements in the earth core, lower and upper mantle as well as chondrite representing for mantle bears this kind of partition pattern. Concretely, Ru is somewhat richer than Pt in the earth core material, and Pt content in mantle however is higher than Ru (Fig.1).

The Ru–Os pattern is characterized by high Ru, Os and low Ir, Rh, Pt and Pd content. Quite a few magnesian ultrabasic rock bodies investigated in China show this PGE partition pattern (Fig.1) That Pt and Pd are greatly higher than Os, Ir, Ru and Rh characterize the Pt-Pd pattern. This pattern is typical for Earth's crust and almost all the ferruginous ultrabasic rock bodies (Fig.1).

Significance. Initial PGE partition in the early evolution stage of the Earth. The crust occupies only little part of the Earth, and therefore the major portion of the Earth is its mantle and core . If we accept the presumption that the Earth was initially a homogeneous body, its composition would certainly different from that of any individual part of the Earth. From the same PGE partition patterns of core, lower and upper mantle , it can be drawn out that the differentiation of platinum group elements was very week during the formation of core and mantle, and its partition pattern, namely the Ru-Pt pattern, reflects the initial partition situation of the early evolution stage of the Earth.

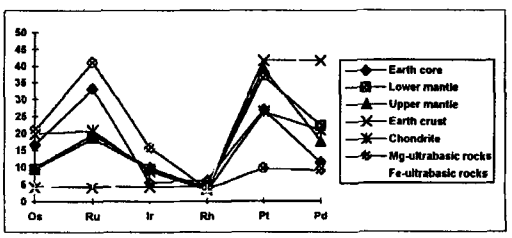

FIG.1. Typical partition patterns of PGEs.

Evolution trend of PGEs in the Earth. The Earth's crust is the product of mantle material evolution . The partition patterns of PGEs in the crust shows that the relatively low melting point, low boiling point elements such as Pt and Pd display their relatively active aspect in evolution, and , consequently, they would be able to migrate along the materials differentiated from the mantle, forming PGE partition pattern relatively rich in Pt and Pd, namely the Pt-Pd pattern, in the crust.

A possible model for the forming of ferruginous ultrabasic rocks. It is well known that magnesian ultrabasic rocks are collector of high melting point materials, and their character will definitely poor in relatively active elements such as Pt and Pd and rich in relatively inertial elements such as Os, Ru, Ir and Rh, showing Ru–Os PGE partition pattern. With regard to ferruginous ultrabasic rocks, some researcher brought fouth a genetic model of basaltic magma differentiation. It is difficult, however, for the differentiation of basaltic magma to lead to the enrichment of Pt and Pd. A possible model for the forming of ferruginous ultrabasic rocks, the authors believe, is the differentiation of inhomogeneous mantle mixed in certain proportion by magnesian with ferruginous ultrabasic rocks.

Distribution patterns

Figures 1 and 2 made with normalized PGE data (original data divided by element content in chondrite, then times 1000) show flat curves for lower and upper mantles which are similar to the

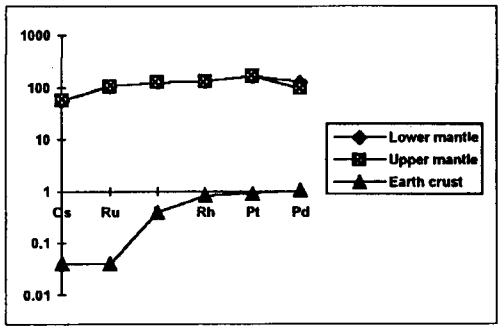

FIG. 2. Typical distribution patterns of PGEs.

curve of chondrite and left declined curve for the crust reflecting relative enrichment of Pt, Pd and Rh, and deficiency of Os, Ru and Ir (Fig. 2). The change of curves from mantle to crust may indicate the activity of PGEs in geochemical process to be Os, Ru, Ir, Rh, Pt and Pd in a increasing order, not to be Os, Ru, Rh, Ir, Pt and Pd.