

**GEOGENIC PLATINUM GROUP ELEMENT (RU, RH, PD, OS, IR AND PT)
AND RE BACKGROUND ABUNDANCES IN THE AUSTRIAN ALPS**

T. Meisel

Institut für Allgemeine und Analytische Chemie
Montan-Universität Leoben, Franz-Josef-Strasse 7. A-8700 Leoben, Austria

The Federal Environment Agency of Austria (Umweltbundesamt, UBA), in cooperation with the General and Analytical Chemistry (University of Leoben, Austria) started an environmental sampling project in soils along major Austrian motorways (from Vienna to Vorarlberg). Emphasis was put on platinum group elements (PGE) since some of these metals are used in automobile catalytic converters. At all sample sites the Rh, Pd, Pt but also Ir and Re significantly exceed natural background values and reach concentrations up to 13 ng/g, 25 ng/g, 134 ng/g, 1.1 ng/g and 9.8 ng/g respectively on the top soil layer adjacent to the motorways.

In this study not only the contaminated soil surface was sampled but also the layer 5–10 cm below the surface and 10 m away from the polluted area. This was done to estimate the natural background level of the sample site. The bedrock below the soil layers is the only PGE source in soils other than automobile catalytic converter. Since motorways are mainly build in valleys, probably on stream sediments, the analysis of soils could give a good average for the geogenic or natural background of the region. It is the aim of this work to compare the regional background level with estimates of continental upper crust based on loess [1], impact melts [2] and European graywackes [3].

The continental upper crust is severely depleted in PGE relative to the Earth's core and mantle and contains < 0.001 % of the terrestrial PGE budget [1]. The extremely low abundance and the analytical difficulties involved in analyzing these elements as well as finding representative samples makes estimations that are essential for geochemical modeling a challenging task. For this study we applied an analytical procedure [4] based on an on-line cation exchange ICP-MS isotope dilution determination after acid attack in a high pressure asher (HPA-S Anton Paar, Graz).

The variation within one site is similar to the variation amongst localities. Thus an overall average can be taken as being representative for all soils sampled in this study. The PGE average abundances in uncontaminated Austrian soils (average of 11 samples from 8 localities) is presented in table 1 and plotted as mantle normalized values in figure 1. Higher Os and Ir abundances than the upper crustal estimates is the most apparent feature. Whereas for all the other elements a comparison is made difficult due to the high variances in concentrations. If Os and Ir are preferentially enriched in soils or if the PGE abundances in an average bedrock is different to the loess (e.g. due to lesser abundance of higher density PGE bearing minerals such as chromite in loess) cannot be said at this stage of the study.

ng/g	Os	Ir	Ru	Rh	Pt	Pd	Re
this work	0.073	0.105		0.050	0.730	0.800	0.185
Lit. [1]	0.031	0.022	0.210		0.510	0.520	0.198
Lit. [2]	0.030	0.030	0.106	0.380		0.500	0.400
Lit. [3]	0.050	0.050	0.100	0.060	0.400	0.400	0.400

Table 1

PGE abundances in soils and PGE estimates of the continental crust.

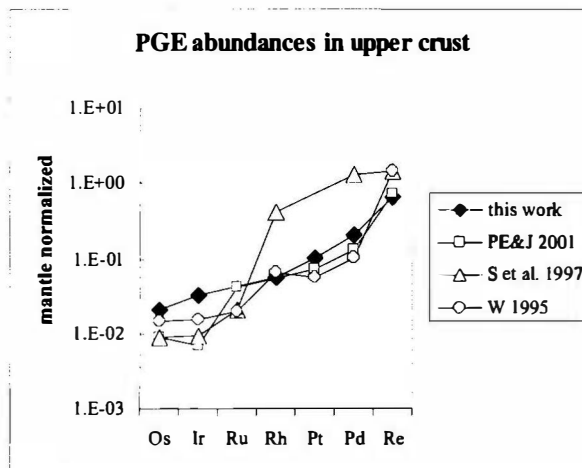


Fig. 1

Mantle normalized abundances in Austrian soils and in estimates for the continental crust. PE & J [1] estimated based on loess, S [2] based on impact melts from the Scandinavian shield [3] based on European graywackes.

References

- [1] PEUCKER-EHRENBRINK, B. ET AL. (2001): Rhenium-osmium isotope systematics and platinum group element constraints: Loess and the upper continental crust. - *g-cubed*, 2, 2001GV000172.
- [2] SCHMIDT, G. ET AL. (1997): Highly siderophile elements (Re, Os, Ir, Ru, Rh, Pd, Au) in impact melts from three European impact craters (Sääksjärvi, Mien, and Dellen): Clues to the nature of the impacting bodies. - *Geochimica et Cosmochimica Acta*, 61, 2977-2987.
- [3] WEDEPOHL, K. H. (1995): The composition of the continental crust. - *Geochimica et Cosmochimica Acta*, 59, 1217-1232.
- [4] MEISEL, T. ET AL. (2003): A simple procedure for the determination of platinum group elements and rhenium (Ru, Rh, Pd, Re, Os, Ir and Pt) using ID-ICP-MS with an inexpensive on-line matrix separation in geological and environmental materials. - *Journal of Analytical Atomic Spectrometry*, 18, 720-726.