

Platinum group minerals (PGM) from chromitites of Kytlym Uralian-Alaskan type complex (Russia)

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Several PGM have been found in two different types of chromitites associated with the Kytlym Uralian-Alaskan type complex (Northern Urals, Russia). Type-1 chromitite forms small schlieren or pods irregularly distributed in dunite, whereas the type-2 occurs as thin layers within amphibole-rich clinopyroxenite veins (Butyrin-veins) cutting across the dunite. Type 2 chromitite is enriched in Fe³⁺ and Ti compared to type 1. The concentration of IPGE (Os+Ir+Ru) decreases from 408-580 ppb in type-1 to 293 ppm in type-2. The latter also distinguishes for a much higher PPGE (Rh+Pt+Pd) content (22679 ppb) compared with type-1 (4776-10836 ppb), showing a Pd-Ir ratio of 151 in front of 0.6 in type-1. Alloys in the Pt-Fe-Ni system (isoferroplatinum tetraferroplatinum and ferronickelplatinum), erlichmanite, cuprorhodite and osmium occur as primary polygonal inclusions in type-1 chromitite. Tulameenite is exclusively located along cracks in contact with secondary ferrian chromite, magnetite and chlorite, or constitutes the metasomatic replacement of primary Pt alloys. In contrast, the PGM assemblage of type-2 chromitite consists of Pd, Hg, Pt and Cu alloys (mainly potarite and Cu-rich potarite) and Pt-Fe-Cu with minor unnamed compounds of Rh-Te-Hg, Pt-Fe-Pd and Pd-Fe-Cu-S. With the exception of few Pt-Fe alloys that occur enclosed in fresh chromite, most of these PGM occur as irregular grains in the contact between chromite and silicates (clinopyroxene and amphibole), usually associated with pentlandite and pyrrhotite. Type-1 PGM precipitated in the high-temperature magmatic stage prior to or concomitant with chromite crystallization, under variable condition of S and O fugacities as well as Fe activity. Only tulameenite formed during low temperature, hydrothermal process. The composition and paragenetic assemblage indicates that PGM in type-2 chromitite derived from a more evolved melt (high Pd-Ir ratio) characterized by the activity of high-temperature fluids enriched in Hg, Te and Cu. The origin of this melt, i) last-stage fractionation of the same melt that generated the type-1 chromitite, or ii) fluid-rich melt derived from an external source, is still open to question.

Comparison of biomass used in Polish power-plants with other types of biomass

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The aim of this study is to compare general characteristics of biomass used in energy production in Poland with other biomass types. We analyzed wood and woody biomass, agricultural straw, and agricultural biomass.

Moisture content (as-received and air dried) is, respectively, within ranges of 5.4-26.2wt% and 1.2-1.6wt%. Ash yield (dry basis, 550°C) varies from 0.8 to 10.6wt%. Volatile matter (dry basis) content is between 72.3-84.8wt%.

The C content in biomass is within the range 49.04-54.51wt% (daf – dry, ash-free basis); O content calculated by difference varies in the interval 37.32-43.26wt% (daf); H within the range of 5.58-6.35wt% (daf); N content is from 0.29-2.93wt% (daf); S content varies from 0.01 to 0.23wt% (daf). The Cl content measured in dry material varies from 0.017-0.253wt%.

Negative correlation between VM(db) and ash content (db) is evident; less pronounced negative correlation exists between O and C. Positive correlation between N and Cl content can be noted. Correlations between major elements (e.g. Ca, Mg, K, Fe) are weak or absent.

Comparison of studied samples of biomass with published data (e.g. [1]) indicates that values of moisture, volatile matter content and ash yield are within relatively narrow range. Ash yield is relatively low in studied samples and volatile matter values are relatively high. The C content is relatively low in comparison with other types of biomass. Oxygen content is rather high. The S, N and Cl contents are relatively low.

[1] Vassilev *et al.* (2010) *Fuel* **89**, 913-933.