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Abstract of PhD

Subject: **Development of a method for the determination of rhenium in geological materials.**

Nowadays, rare and precious elements become again a major importance. It is connected with the fact, that their properties are used in the industry. Therefore, a lot of research programs for the study of mineralization containing rare (critical) elements are opened. One of the critical element is rhenium, which occurrence in Poland has not been fully explored. Copper deposit Legnica - Głogów Copper (LGOM) is one of the few in the world, from which rhenium is recovered from tail materials of copper ore. Literature on the occurrence of rhenium in different lithological types of LGOM ore and minerals is still very poor. By implementation of innovative techniques for determination of mineralogical and lithological analyses, it was possible to combine chemical and mineralogical analyses to characterize rhenium in different lithological ore types.

Research work was presented in two aspects: chemical and mineralogical. Chemical aspect shows not only validation of the method of determination of rhenium in geological samples, but also characteristic of three lithological types according to presence of major and associated elements (Cu, Ag, Mo, Corg , Fe, Zn, Mn, Pb, Co, Ni, V) and their correlation with rhenium. Mineralogical aspect shows validation of innovative methods for determining of the lithological and mineralogical analyses using MLA (Mineral Liberation Analyzer) technique and mineralogical characterization of lithological types in LGOM. Based on the chemical results a correlation of rhenium with molybdenum was noticed.

According to validation process of determination of rhenium in geological materials two ranges of expanded relative uncertainty were calculated (dla α=0,05 i k=2):

- in range 0,001 – 2,0 [g/Mg] content of Re, $Uc_{wzgl} = \pm 46$ [%],
- in range 2,0 – 50,0 [g/Mg] content of Re, $Uc_{wzgl} = \pm 12$ [%].

In a validation process it was also calculated expanded relative uncertainty in the range of Uc=9% for determination of mineralogical and lithological analyses using MLA. The highest content of rhenium are presented in shale samples from 0,98 g/Mg to 45,87g/Mg. The lowest content of rhenium present in the dolomite type (the only sample in which rhenium was detected. The sandstone samples rhenium was detected only in the two samples,

and the contents were at 0,97g / Mg and 5,97g/Mg. It has been also found that the best correlation with rhenium shows molybdenum – 0,8493. Additionally, content of rhenium in molibdenite also depends on ore type. The lowest content of rhenium was found in hydrothermal type or with the range from 0,23ppm to 0,63ppm. The highest content of rhenium in molybdenite was found in the miarole pegmatite from the deposit Cermonorec in Bulgaria - 253ppm. Type porphyry deposit from Myszków was also characterized by a high content of Re - 95,7ppm. The highest measured concentrations of rhenium is marked in molibdenium concentrate from the deposit porphyry Cu-Mo Erdenet, Mongolia - 368ppm. Thanks to innovative MLA technique a Standard List of minerals for LGOM was created. It was also measured and characterize additional molybdenium mineral – castaingit.