Geochemistry and mineralogy of uranium in graphite deposit from Catalinul, Baia de Fier, Romania

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The Catalinul graphite deposit is hosted in pre-Alpine basement rocks of the Lainici Paius Group represented by medium to high-grade migmatized metasediments rich in carbonaceous matter, intruded by granitoid bodies and porphyry dykes[1]. The graphite deposit, lenticular in shape, appears in graphitic schist bounded by paragneiss - micaschist in the hanging wall [1-2]. Graphite is mainly flake graphite, sporadically also occurring as massive aggregates, with high graphitization index.

Uranium estimate as ^{238}U, and natural radioactive element associated ^{232}Th concentrations were measured in each category of graphite non-destructively using gamma-ray spectrometry, with HPGe detector. Optical microscopy and Scanning electron microscopy were used to characterize the mineralogical composition of the associated minerals.

The radiometrical data show values for ^{238}U greater than ^{232}Th values. This tendency is correlated with graphitization index, high content of ^{238}U, up to 9.55 ppm, is typical for massive graphite samples. In this case ^{232}Th has insignificant values (1.66 ppm), whereas in graphite with high level of impurities increses content of ^{232}Th up to 24.15 ppm, while the content of uranium decreases slighthly.

Petrographicaly, the quartz, plagioclase, K-feldspar biotite, muscovite, sillimanite, cordierite and sulphide minerals are the major gangue minerals. The SEM results indicate that monazite, zircon, uraninite, coffinite, urano - thorite, rutile are the principal U-bearing minerals. In massive graphite metamict zircon is the dominant accessory mineral, including unzoned to iregulary zoned uraninite. In flake graphite monazite – (Ce) is distinctly dominant, along with less frequent rutile. Uraninite and coffinite occurs as inclusion in monazite. Typical for the relatively homogeneous monazite crystals is an unusually high uranium content.

The graphite crystalline have no inclusions, all radioactive phases are asociated with gangue. The high uranium contents might be tectonically controlled as the graphite deposit is placed in a shear zone acting as a potential pathway for uranium-bearing solutions precipitating in contact with reducing graphite.

[1] Berza et al. (1996) Precambrian Research (80), 281 – 301

[2] Trifulescu. (2008) Monografia Mondiala a Grafitului, 365