

Carbon-13 and Uranothorianite age dating in the Botogol Alkaline Massif Graphites (Eastern Sayan, Russia)

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Botogol alkali pyroxene and nepheline syenite rock massif located in the Altai-Sayan region in the southwestern part of the Siberian platform's folded framing. Alkaline rocks intruded through carbonate-shale strata of Proterozoic age. Graphite is widespread in alkaline massif rocks and has a form of stockworks, veins and small veinlets as well as disseminated occurrences. There are several types of graphite identified: a massive, tree-like, droplet-like, fishscale-like. Pure graphite containing massive graphite areas with high concentrations of U (up 0.4%) and Th (2%), in the forms of uranothorianite and thorite. There are "crystals" with unusual decay structures founded. Cubic "crystals" (1-3 mm), consisting of graphite filled with concentrically zoned uranothorianite spherulites (30-50 microns). The center of the spherulite consist of a cubic uranothorianite crystal (5-8 microns), surrounded by splitted radially grown crystals of uranothorianite. Mineral occurrences of this type may indicate a joint transport of U, Th and C, in the form of a volatile compounds. The uranothorianites age was determined based on results of chemical analysis using scanning electron microscope MIRA 3 equipped with INCA Wave 500 microanalysis system and defined as $510 \pm 13 - 519 \pm 10$ Ma. This age dating is in the good agreement with the results obtained for the Botogol massif using Rb-Sr isochron (492 ± 11 Ma) and also K-Ar (biotite, 521 and 492 Ma) [1]. These age data indicates that graphite and uranothorianite were formed during the magmatic stage. The isotopic values of carbon in the graphite associated with uranothorianite (in the mikrosamples of ~ 1 mg) were equal to -8.1/-5.7 and pure graphite values are -5.1/-10.7 permille. These data indicate mantle source of carbon. Botogol alkaline massif origination corresponds to the time of Neoproterozoic plume magmatism development (520-460 Ma).

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[1] Nikiforov & Yarmoluk (2007) *Proc. RAS*, 412, 81-86.

Geological characteristics and mineralization stages in the Yaojialing Zinc-Gold ore deposit, Tongling Ore District, Anhui

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The Yaojialing deposit is located in the Tongling ore district, Middle-Lower Yangtze River Belt, East China. The deposit has measured reserves of 1.2 Mt of Zn with an average grade of 3.64%, 32 t of Au (5.02g/t Au), and Pb,Cu and Ag as by-products[1]. The main orebodies, whose shapes mainly include lenticular or bedded, situate along the contact zone with Early Permian limestone of the Qixia Formation and Late Jurassic granodiorite porphyry intrusion or occur inside limestone xenoliths entrapped within the intrusion. The mainly encountered ore minerals include sphalerite, chalcopyrite, galena, pyrite, gold and magnetite, gangue minerals are represented by calcite, quartz, garnet, diopside, vesuvianite, fluorite. Euhedral to anhedral granular texture, metasomatic texture and disseminated-massive structure are considered to be the dominating ore texture and structure. Hydrothermal alteration is well developed and is primarily composed of skarnization, K-feldspar alteration, silicification, carbonatization, sericitization, clayzation. Needs to be emphasized that silicification and carbonatization are closely related to mineralization. The mineralization process of it can be divided into three stages and from early to late they are: (1) skarn stage, which witnesses filling of garnet and diopside in the contact zone or inside the intrusion; (2) oxidization stage, which is the magnetite stage; (3) Quartz-sulfide-carbonate stage, in which most economic Zn and Au mineralization is formed.

Conclusion: From what has been discussed above, it could be inferred that Yaojialing ore deposit is a skarn-type ore deposit.

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[1] Wen *et al.* (2011) *Mineral Deposits* 30(3) : 533-546 (in Chinese).