# Biotites of the outer fenitization zone rocks of Chernigov carbonatite complex

**Nadiia Yurchenko**

M.P. Semenenko Institute of Geochemistry, Mineralogy and Ore Formation of the Ukrainian National Academy of Science, Kyiv, Ukraine (nadysya88@gmail.com)

The object of the study is biotites from crystalline rocks of the eastern part of Chernigovka carbonatite complex fenite halo, Ukrainian Shield (the well № 968).

The goal of the study is to detect the place of biotite in metasomatic sequence of crystalline rocks changes of the complex frame and the nature of possible changes of its optical parameters depending on the intensity of metasomatic processes.

The solved problems were to analyse the optical spectra of biotite absorption from gneisses, composite gneisses and biotite-amphibolitic crystalline schists and analyse their composition, to calculate possible crystallization temperatures by monomineralic biotite geothermometer and using petrofabric studies to reveal mineral paragenesis and the interrelation of minerals that accompany the emergence of biotite.

Petrographic studies by signs (Lukiyenko *et al*., 2008, Passchier *et al*., 1996) revealed at least three tectonic events, which were reflected on the formation of the mineral composition and structure of the crystalline rocks of the frame in the outer frame of the Chernihivka carbonatite complex. The earliest event is shown in intergranular recrystallization of rock-creative minerals of primary crystalline rocks, which can be granodiorites, tonalites and diorites with the creation of the corresponding composition tectonic gneisses and crystallization in the planes of recrystallization of oriented prismatic crystals and chains of hornblende and clinopyroxene. The second event, that is recorded, is the emergence of new paragenesis, which is lattice microcline and biotite, which are usually around magnetite as the reactionary mineral. At this stage which has passed in the mode of the brittle deformation with the sliding and the formation of cracks and voids, cataclasites get soaked with metasomatic fluids of potassium silicon nature and form impregnates of quartz potassium feldspar composition with diaphthoritic partial replacement of primary minerals into secondary ones: transformation of plagioclases to potassium feldspar, biotite recrystallization and regeneration, formation of blue-green and colorless amphibole in hornblende, pseudomorphic replacement of clinopyroxene by celadonite. The third tectonic event on the level of greenstone conversion is chloritization of mafic minerals, epidotization and sericitization of plagioclases, fulfillment of cracks by calcite.

Formation of biotite is associated with the first and second tectonic events. The first generation is represented by separate flakes or intergranular packages of small flakes that are hardly deformed. In all the above varieties the biotite ferruginosity is almost identical and by the correlation of formula coefficients of magnesium and iron it allows to refer them to the transitional species between annites and phlogopites with low iron content ($K_{Fe}$=0.30–0.35). The second generation differs only by the morphology of the crystals and relatively small low content of titanium which is reflected in the decrease of the calculated parameters of possible crystallization temperature (Luhr *et al*., 1984) in the most K-feldsparized varieties.

Studying of biotites optical spectra shows, that with the increasing of kalifeldsparization level of rocks the biotites overall light absorption level decreases and it is the most notable in the field of 720 nm (transition of $Fe^{+2} \rightarrow Fe^{+3}$) as a result of lowering of oxidation degree of its crystallization environment (Taran *et al*., 2013).

The conducted studies have shown that the outer zone of the fenite halo around the alkaline and carbonatite bodies of Chernihivka complex is characterized by impregnation type of silicon potassium metasomatic transformation of crystalline rocks frame. Biotite, the formation of which accompanies this process, is characterized by low ferruginosity and relatively reduced level of light absorption including the range of 720 nm, that together with petrographic observations suggest a restorative nature of metasomatic fluids. The gradient of crystallization and recrystallization temperature of biotite is 100°C and is embedded in a range of 640-540°C.

Luhr, J., Carmichael, I., Varekamp, J. (1984): J Volc Geotherm Res, 23: 69-108.

Lukiyenko, A., Kravchenko, D., Sukhorada, A. (2008): Dislokatsionnaya tektonika i tektonofatsii dokembriya Ukrainskogo shchita: monografiya, M Izdatel'sko poligraficheskiy tsentr «Kiyevskiy Universitet »: pp. 279.

Passchier, C., Trouw, R. (1996): Microtectonics. – Springer-Verlag Berlin Heidelberg New York: pp. 290.

Taran, M., Kryvdik, S., Pavlova, N. (2013): Mineral J (Ukraine), 35/1: 60-71.