MINERALOGICAL STUDY OF UPPER CAMBRIAN GLAUCONITES FROM TEXAS, USA

CORA, I.[1], TÓTH, E.[1], WEISZBURG, T. G.[1] & ZAJZON, N.[2]
[1] Department of Mineralogy, Eötvös Loránd University, Pázmány Péter sétány 1/C, H-1117 Budapest, Hungary
E-mail: coraildiko@gmail.com
[2] Department of Mineralogy and Petrology, University of Miskolc, H-3515 Miskolc-Egyetemváros, Hungary

This work presents the first step of our study, the thorough mineralogical characterisation of two Palaeozoic glauconite populations. Palaeozoic glauconites are thought to have formed under different conditions than their Cenozoic counterparts (CHAFETZ & REID, 2000). To better understand the formation conditions of glauconites prevailing during the Palaeozoic era, we started to study glauconite-bearing Palaeozoic rocks. As such rock types are not typical for the Carpathian Region, we selected two glauconite-rich limestones from the Upper Cambrian of Texas, USA. The first sample originates from the Lion Mountain Member of the Riley Formation, while the other comes from the Morgan Creek Member of the Wilbern Formation, the latter being younger by a few million years. A detailed geological background of the studied samples is given by CHAFETZ & REID (2000).

Both samples were crushed and decarbonated by 5% acetic acid. The free grains were separated upon grain size (> 1000 μm, 1000–500 μm, 500–250 μm, 250–125 μm, 125–63 μm, 63–32 μm and < 32 μm), magnetic susceptibility (0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 A current) and density. For the density separation bromoform (tribromomethane) was diluted with ethyl alcohol, and density separation was carried out in the 2.83–2.48 g/cm^3 range with density steps of 0.05 g/cm^3.

The sample from the Lion Mountain Member is a limestone, cemented by white sparry calcite (67 wt% of the whole rock). Glauconite often forms dark green horizons within the rock. The total glauconite content of the rock is 8 wt% (for glauconite grains > 32 μm). The total amount of insoluble grains below 32 μm is 4.5 wt% of the whole rock, and this fraction contains glauconite grain fragments, too.

The grains insoluble in acetic acid were separated into 84 fractions. Glauconite proved to be very mature: 80% of the grains are of a density above 2.78 g/cm^3. The glauconite grains are usually rounded, cracked and some of them are bowl-shaped. The cracks in the glauconite grains are sometimes filled with "limonite". The surface of the glauconite grains is usually smooth. The glauconite population is characterised by a broader, symmetric 001, d_{001} = 10.16 Å, d_{060} = 1.517 Å. Beside glauconite the sample contains rounded quartz grains (17 wt%), some of them still preserving their original euhedral shape. Sphere-shaped "magnetite" (= strongly magnetic, opaque grains) appears as inclusions in quartz. Apatitic brachiopod test fragments (0.3 wt%) are also present. In the 63–32 μm grain size fraction elongated euhedral zircons are also abundant. The grains are often cemented into aggregates by "limonite".

WDX analyses on non-separated glauconite grains in thin section yielded the following average formula (Fe^{2+} estimated for 15% of the total Fe content):

$$K_{0.77}Na_{0.01}Ca_{0.02}(Fe^{3+}_{1.24}Mg_{0.40}Fe^{2+}_{0.22}Al_{0.18})[Si_{3.67}Al_{0.33}O_{10}(OH)_2].$$

The limestone sample from the Morgan Creek Member is cemented by yellowish sparry calcite, which is more coarsely crystalline than in the case of the other sample and composes 86 wt% of the whole rock. Glauconite grains are evenly dispersed within the rock, they do not accumulate into dark green horizons as in the other sample, and the total glauconite content is also lower (approx. 1.8 wt% in the grain size fractions > 32 μm). The density distribution curve of the glauconite grains is a bit more elongated towards the lower densities, but the population is still very mature: 65% of the glauconite population is denser than 2.78 g/cm^3. The glauconite grains are usually angular, elongated grains of biogenic origin are also frequent. The glauconite population is characterised by symmetric 001, d_{001} = 10.16 Å and d_{060} = 1.521 Å. Separated glauconite grains still contain apatite and calcite. Beside glauconite, the sample contains euhedral dolomite (0.43 wt%) of some iron substitution. The dolomite rhombohedra are originally transparent, but some of the grains are stained with "limonite" along the cleavage planes. Limonite pseudomorphs after dolomite rhombohedra are also frequent. Further detrital constituents are chlorite, biotite, muscovite, quartz and apatitic brachiopod test fragments.

Chemical and crystallographic data collection on the separated glauconite fractions is in progress.

The authors thank GRY BARFOD (University of California, Davis, USA) for providing the studied samples. This research was financially supported by the European Commission's Research Infrastructure Action via the SYNTHESYS Project and the Natural History Museum, London.

Reference

CHAFETZ, H.S. & REID, A. (2000): Sedimentary Geology, 136: 29–42.