Mineralogy and geochemistry of clay layers and partings from the Maritsa East lignite basin, Bulgaria

D. DIMITROVA[1]*, S. GEORGIEV[1], M. VETSEVA[1], M. YOSSIFOVA[1], Y. TZVETANOVA[2] AND R. IVANOVA[1]

[1]Geological Institute, Bulgarian Academy of Sciences, 1113, Sofia, Bulgaria (didi@geology.bas.bg)

[2]Institute of Mineralogy and Crystallograohy, Bulgarian Academy of Sciences, 1113, Sofia, Bulgaria

The Maritsa East lignite basin is located in the easternmost part of the Late Alpine Upper Thrace depression (SE Bulgaria). The Late Oligocene-Miocene Maritsa Formation is composed of black, gray, and grayish-green clays interlayered with three lignite seams. The medium lignite seam (15-28 m thickness) is interbedded with thin (5-15 cm) beige white silty-clayey parting layers (Tr1-2 and TrN-3). The clays contain mainly montmorillonite, kaolinite, and quartz with minor mica, plagioclase, K-feldspar, calcite (mollusk shells), accessory apatite (fish bones), framboidal pyrite, zircon, and coal matter. The Tr1-2 and TrN-3 slightly differ in mineralogy: with dominant kaolinite and plagioclase, as TrN-3 also have mica, K-feldspar, chlorite, and montmorillonite. Major element oxides are SiO_2 and Al_2O_3, except two samples enriched in CaO (6.3 and 22.6 wt.%, with Ctot – 12.9-13 wt.%) due to the presence of mollusk shells. Total S is ranging from 0.3 to 1.6 wt.%. The P_2O_5 is highest in the clays containing fish fossil remains (0.2-0.5 wt.%). The Fe_2O_3 is 2.7 to 7.6 wt.%, lowest in Tr1-2 – 0.7 wt.%. The TiO_2/Al_2O_3 is 0.03-0.04, suggesting origin from resedimented intermediate rocks. The low TiO_2/Al_2O_3 of Tr1-2 (0.004) denotes an acid volcanic ash origin [1]. The clay layers and partings are enriched in Ba, Rb, Sr, Zr, V, Cr, Ni, Cu, Zn, and Pb. The Th/U is from 1.4 to 4.6 and U and Th are in the range (ppm) of 1.2-12.8 and 2.6-23.9, respectively. Total REY content is from 34 (Tr1-2) to 353 ppm (TrN-3), usually 120-220 ppm (black and grayish-green claystones), which defines them as not promising for REY extraction. The upper continental crust normalized REY patterns, La_N/Lu_N, La_N/Sm_N, and Gd_N/Lu_N attribute most clays to the mixed L-M type, whereas Tr1-2 shows characteristics of the H-type [2]. The weak positive Eu/Eu* (1.1-1.4) and negative Ce/Ce* (0.8-0.9) anomalies can be explained with Eu scavenging of basin water in slightly reduced deposition conditions [3].

[1] Addison *et al.* (1983) *Int. J. Coal Geol*. **3**, 1–30. [2] Seredin & Dai (2012) *Int. J. Coal Geol*. **94**, 76-93. [3] Dai et al. (2016) *Int. J. Coal Geol*. **159**, 82-95.