

Inorganic geochemical components of Paleozoic source rocks associated with basin stratigraphy and depositional processes

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Black shales of the north-western part of the Dnieper-Donets basin have been investigated by XRD- and XRF-analyses to obtain information regarding the inorganic composition, the conditions of formation and the depositional environment. A correlation between the distribution and variation of the mineralogical composition of 122 core samples of 15 wells, and the tectono-stratigraphic sequences of the basin took place, as well as the analyses of the relationship between mineral phases, trace elements and organic parameters.

The clay mineral content of the Devonian to Bashkirian black shales ranges from less than 20 to more than 80 Vol.% with a significant variability of the main components: kaolin-group and mica-group minerals. Mixed-layer illite/smectite is dominated by illite. The non-clays comprise primarily quartz, carbonates, feldspar and pyrite. Concerning the trace metals titanium shows the largest proportion. The total trace element content analysed by the Ni/Co-, and V/Cr-ratio reflects the euxinic milieu.

Within the stratigraphic succession the following significant lithofacial variations are observed: in some Devonian black shales feldspar exceeds 10 Vol.-% and glauconite occurs. An increased chlorine concentration indicates the effects of salt tectonics during the syn-rift phase. Significant for Tournaisian and Lower Visean are kaolinite contents up to 90 Vol.-% and pyrite contents which exceed 10 Vol.-%. The mineralogical composition of the Visean sediments reflects continental deposition suggested by increased Zr-, Nb-, Ti-values, and deposits of cyclic successions in fluvial, shallow marine and lagoonal environments [1]. In Upper Visean the amount of kaolinite decreases while the percentage of illite increases. On the north-eastern rim of the Srebren and Zhdanivske Depression, samples of the Upper Visean (C1v2 19/20) show an increased amount of anatase. Apatite can be directly correlated with the phosphorus content. The amount of the TOC content [2] can be associated with the percentage of kaolinite, pyrite/marcasite and quartz. Overall, in the Lower Serpukhovian and the Bashkirian a decrease of kaolinite and mixed-layer clays and increase of chlorite, illite and the enhanced quartz content indicate the lithofacial change.

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