DISTRIBUTION OF AUTHIGENIC CLAY MINERALS IN ROTLIEGEND AEOLIAN SANDSTONES FROM THE FORE-SUDETIC MONOCLINE, SW POLAND

BIERNACKA, J.
Institute of Geology, University of Poznan, Makow Polnych 16, 61-606 Poznan, Poland
E-mail: julbier@amu.edu.pl

The amount, distribution pattern and morphology of clay minerals are of key importance for reservoir properties of sandstones. These parameters vary regionally, even for one sedimentary basin, and are dependent on a number of agents. The distribution of clay mineral cements was studied for aeolian sandstones of the Fore-Sudetic Monocline, one of gas-perspective areas in Poland, by a combination of XRD, optical microscopy and SEM. Illite, chlorite and kaolinite constitute the most ubiquitous cements in the sandstones studied. Their distribution pattern shows distinct relation to a palaeogeographic pattern, *i.e*. the location of sand dunes with regard to a playa lake and a local high (Wolsztyn High), the latter dividing the dune field into the Eastern Erg (facing the playa) and the Southern Erg.

Chlorite

Chlorite is a common mineral in the entire belt of the Eastern Erg, *i.e*. the dune field located between the playa lake and the Wolsztyn High, *ca*. 100 km long and 40 km wide. Conversely, the mineral is absent (or almost absent) in sandstones of the Southern Erg, separated from the playa by the Wolsztyn High. Because the amount of chlorite increases towards the playa, most probably the mineral crystallized from solutions derived from this lake during early diagenesis. Diffraction patterns of chlorite suggest the occurrence of Mg-rich variety. Chlorite forms flakes and platelets on the surface of grains.

Illite

Illite is the most ubiquitous authigenic mineral in the Rotliegend sandstones, it occurred in each sandstone studied. The XRD studies confirmed the occurrence of almost pure illite, with only minor admixture of highly ordered mix-layered illite-smectite. Some sandstones from the eastern part of the Southern Erg contain exclusively illite, without noticeable amounts of other clay minerals. The morphology of authigenic illite is variable – from play to hairy and fibrous. Fibrous illite is a late diagenetic phase; it grows on plates of earlier illite.

Kaolinite

Kaolinite occurs only in sandstones of the Southern Erg and it is unevenly distributed. The mineral shows a negative correlation with the content of feldspar, coming arguably from its destruction. The uneven distribution of kaolinite, even in sandstones lying at the same depth in geographically close areas, suggests its growth from acid fluids flowing along faults. Probably, the acid fluids were derived from basement Carboniferous coal-bearing rocks. Kaolinite forms pseudohexagonal plates, usually stacked into vermicular aggregates.

The Fore-Sudetic Monocline and Szczecinâ€“MiechÃ³w Synclinorium. The Fore-Sudetic Monocline is a block in which poorly known basement is covered by Permo-Mesozoic succession of variable thickness and unconformably by approximately 350 m of Cenozoic sedimentary rocks (Mazur et al. 2010a).Â Permian clastic Rotliegend sediments are intercalated with Upper Carboniferous to Permian volcanic rocks representing wide range of volcanic forms and compositions (Breitkreuz et al. 2007; GeiÃŸler et al. 2008; Å»elaÅºniewicz et al.Â Our calculations show that Moho heat flow beneath Sudetic and Fore-Sudetic Blocks is close to 30 mW/m2. It is similar to upper limit of mantle heat flow beneath Erzgebirge (FÃ¶rster and FÃ¶rster 2000). Petrophysics of rotliegend sandstones for unconventional tight gas exploration Â– case study of Polish Permian Basin . 511. Justyna NOSAL & Marta WALICZEK. Basin-centered gas accumulations in Rotliegend sandstones Â– case study of Polish Permian Basin, first results . 513.Â Primary and secondary copper minerals from RÃ³dziny, Rudawy Janowickie, Sudeten, Southwestern Poland . 515. Gabriela PIECZARA & Grzegorz RZEPA.Â Static 3D model of the Rotliegend deposits Â– case study from natural gas field area, Fore-Sudetic Monocline, Western Poland . 555. Dmitry ZASTROZHNOV, Andrei KHUDOLEY & Vladimir VERZHBITSKY. Shale contains an appreciable content of clay minerals or derivatives from clay minerals, with a high content of detrital quartz; containing at least 50% silt, with 35% clay or mica fraction, and 15% chemical or authigenic materials (Krynine, 1948). The term shale was originally applied to laminated clayey rock, but now applies to thinly laminated or fissile claystone, siltstone, or mudstone.Â From the above definitions, it is easy to see why shale and clay are so often used interchangeably. We can also see that shale is related to clay through its composition -shale is basically a rough mixture of about half clay and half silt.Â Â· Authigenic clays: rather than being transported, these clays precipitate from solution at a later time.