Geophysical Research Abstracts
Vol. 21, EGU2019-6772, 2019
EGU General Assembly 2019

Effect of water-rock interaction on particle shapes in sandstone samples (Pannonian Basin, Hungary)

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Pore water- rock interaction may cause dissolution and precipitation of different minerals. These processes influence the particle/pore shapes, grain/pore size. In this study we analyzed thin sections of sandstones with 2D image analysis (Morphologi G3SE ID) to specify the most characteristic shapes of the different minerals and pores.

The studied samples originated from the Pannonian Basin, which filled with fluvial sediments in the Late Miocene. Sandstone samples from the Lower Pannonian turbiditic sediments were analyzed from 1500 to 2250 m depth range. The previous studies show that the detrital minerals are quartz, muscovite, dolomite, K-feldspar and plagioclase. The main diagenetic minerals are carbonates (calcite, Fe-dolomite, ankerite, siderite) and clay minerals (illite, kaolinite). The ankerite and calcite is commonly a pore filling cement phase. Moreover, the ankerite grew on the surface of the detrital dolomite grains as a rim. Fine grain siderite was found as replacement of detrital biotite with the recognizable structure of the precursor mica. Kaolinite can be found as a pore filling cement, as cement replacing feldspars and as intergrowth between detrital mica plates.

In this study we measured sandstone samples by Morphologi G3SE ID, which is a method of 2D image analysis with chemical characterization (Raman spectrometer). We characterized the mineral composition of the >45 μm grains from the specified particles. The results show that HR circularity is in correlation with aspect ratio, furthermore, convexity and HS circularity also signed a trend. According to the results, the muscovite is a well separable group (HS circularity $\sim$ 0.36; aspect ratio $\sim$0.36, convexity $\sim$0.86). The quartz and feldspar grains show high variability of the shapes (HS circularity: $\sim$0.2-0.9, aspect ratio: 0.2-1, convexity: 0.8-1), because these minerals are detrital minerals and sometimes arrived as lithic fragments, from which one part dissolved. The shape of carbonate mineral is the following: Hs circularity 0.3-0.8, aspect ratio 0.3-0.8 and convexity 0.8-1. The shape of carbonate minerals depends on the original pore size and shapes, because these minerals mainly diagenetic minerals. The dolomite presents as detrital mineral, however, the shape of these grains depends on the diagenetic ankerite, because ankerite replaced the rim of dolomite. Shape of the pores we can divided in three groups: 1) circle (bubbles of the glue) 2) particle shapes (during the sample preparation mineral grains can fall out) and 3) normal pores. The study was supported from FK128230.