# Diagenesis and Reservoir Quality of Pannonian Lacustrine Deposits in the Makó Trough, Southeastern Hungary

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## ABSTRACT

The shale gas and tight gas potential of Pannonian sediments in the Makó Trough has been explored by several hydrocarbon companies. The deepest sub-basin of the Pannonian Basin has a sedimentary infill of more than 6000 m. In this study, we present the preliminary results on the diagenetic history and the porosity evolution of different types of deposits: calcareous hemipelagic marls with sandstone intercalations (Endröd Formation), turbidite lobes (Szolnok Formation) and slope deposits (Algyö Formation). Petrographic (optical microscopy, CL, blue light microscopy) and geochemical methods (SEM-EDX, WDX, O and C stable isotopes) were applied on core samples of two wells (3012- 5479 m). Processes which have influenced the porosity evolution of the sandstones are compaction, cementation, mineral replacement and dissolution. The most common diagenetic minerals are carbonates (non-ferroan and Fe-bearing calcite, dolomite and ankerite), clay minerals (kaolinite, mixed layer illite-smectite and chlorite) and other silicates (quartz and feldspar). Initial clay mineral and ductile grain contents also influence reservoir quality. The amount of diagenetic carbonates increases with depth, while kaolinite and secondary porosity decrease. The volumetrically most significant diagenetic minerals are calcite and clay minerals. The petrography of calcite is variable (bright orange to dull red luminescence color, pore-filling cement, replacive phases which are occasionally scattered in the matrix). The δ13 C-PDB values of calcite range from 1.7 ‰ to -5.5 ‰, while δ18 O-PDB values range from 0.5 ‰ to -9.1 ‰, no depth related trend can be observed. These data suggest that calcite occurs in more generations, i.e. eogenetic pre-compactional and mesogenetic post-compactional. Kaolinite is present in mottles similar in size to detrital grains. Remnants of feldspar in these mottles indicate feldspar alteration via influx of water rich in organic derived carbon dioxide. Secondary porosity can be observed in carbonates and feldspars at some levels, causing the improvement of the reservoir quality.