Results of caprock and reservoir studies in the Mihályi-Répcelak area, western Hungary

CS. KIRÁLY[1*], Á. SZAMOSFALVI[2], E. SENDULA[1], I. KOVÁCS[2], P. KÓNYA[2], CS. SZABÓ[1] AND GY. FALUS[2]

[1]Eötvös University, 1/c Pázmány Péter sétány, Budapest, H-1117 (correspondence*csilla.kiraly.hu@gmail.com)

[2]Geological ang Geophysical Institute of Hungary, 14. Stefánia út, Budapest, H-1143 (falus.gyorgy@mfgi.hu)

Study of natural CO_2 occurrences delivers information about the long term effect of CO_2 on the behavior of reservoirs and caprocks. This is an important input in the selection procedure of a potential industrial CO_2 injection site. In this study we present the results of study on caprocks and reservoir rocks from two bore holes at a natural CO_2 occurrence. In order to characterize the natural CO_2 occurrence, we applied the following analytical instrumentation: polarization microscopy, XRD, FTIR and SEM. The petrophysical properties are determined from the interpretation of geophysical well-logs and grain size distribution.

Detrital minerals in the reservoirs are quartz, K-feldspar, albite, mica and dolomite whereas diagenetic minerals are carbonate minerals (calcite, siderite, ankerite, dawsonite) and clay minerals (kaolinite, illite). Our results reveal that the most visible effect of CO_2 is the formation of dawsonite in the sandstone samples. Furthermore, the crystallisation of dawsonite is in close relation with the dissolution of albite. Therefore, dawsonite formation seems to be a local process in the studied rock samples.

The Mihályi-Répcelak natural CO_2 occurrence is believed to be leakage safe. There is no known seepage on surface. It is suggested that the clay mineral rich caprock can stop vertical migration of CO_2 into other reservoirs or to the surface. The most important petrophysical characteristics of caprocks is that they have low permeability (<0.1 mD) and porosity (eff.por. = 4%) and high clayeyness (approx. 80%).

In this study we demonstrate that in addition to these parameters, geochemical properties of the caprock are vital for long term safety. The mineral composition of the caprock is similar to that of the reservoir rock, however, the ratio of components is different. The results of petrographic analysis indicate that reaction between CO_2 and the caprocks has taken place in the form of dawsonite crystallisation, again in close textural relation with albite. Therefore, despite the lack of surface CO_2 leakage and excellent sealing properties the CO_2 may migrate through the caprocks in geological time scale. For this reason, through knowledge of caprocks is important.