CRYSTALCHEMISTRY OF CLAY-MINERALS AROUND THE BORDER OF AN OVER-PRESSURE ZONE IN ONE OF THE DEEP SUB-BASINS OF THE SOUTHERN PART OF THE GREAT HUNGARIAN PLAIN

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In this contribution the smectite to illite transition and the maturation of organic matter have been studied with increasing temperature and pressure, i. e. with increasing depth in one of the sub-basins of the Pannonian Basin (Hungary) called Hódmezővásárhely-Makó trench. Hódmezővásárhely-I is the deepest borehole (5842.5 m) in Hungary traversing only Pannonian (s. l.) sedimentary formations built up mainly of marls, marly shales, shales and sandstone. Clay fractions extracted from the core samples were studied by XPD using method given by Reynolds and Moore (1997) in order to estimate the smectite content of mixed-layered illite/smectite. Orientated air-dried ethylene-glycolated and glycerolated, Mg-saturated air-dried ethylene-glycolated and glycerolated, and heated to 350 and 550°C <2 μm fraction mounts were measured in order to determine the mineral assemblages, the smectite % (S %) and the order of the I/S phases. In the course of diagenesis the regular pattern of the smectite content of I/S is diminishing with increasing depth. In the present case, however, an anomalous change – increasing, than stagnating S% – in this sequence was detected in the depth of 4500-5800 m, where dominantly pelagic marls and marly shales occur. In the same zone, the corresponding vitrinite reflectance values showed also a sharp change. The estimated pore pressure data for this depth range indicated an overpressure zone between 4500 and 6000 m, that could result in interrupting the continuos dehydration of smectites and could be responsible for the stagnation of the smectite content of the I/S in this zone. The increase of smectite content, however, could certainly not be explained by the pressure conditions. A possible explanation lay in the actual crystalchemistry, that is the real structure, the in situ interlayer and/or octahedral, tetrahedral co-ordinated cation distribution, that is the individualism of this clay mineral assemblage, resulting in a decreased reactivity. Another possible approach is the supposition of an abrupt change of the source (containing smectite-like clay of a different kind) of the sedimentary rock. A nanometer scale crystalchemical study has been carried out on the undisturbed in situ smectitic material using analytical TEM technique the revealed several interesting facts that will be discussed.

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