Diagenetic Mineral Reactions Related to Hydrocarbon Migration as a Tool in Deep Clastic Reservoir Prediction – Evidence from Permian Red Bed Reservoirs of the Central European Basin System

Gaupp, Reinhard[1], Robert Schöner[2] (1) University Jena, Jena, Germany (2) Friedrich-Schiller-University Jena, 07749 Jena, Germany

Red bed sandstones are important hydrocarbon reservoirs worldwide. In sedimentary facies types with high primary porosity and permeability, diagenetic processes are major control of reservoir properties during deep burial. Organic rich fluids, which may have positive and/or negative effects on reservoir properties, are omnipresent in areas where one prospects for oil and gas reservoirs. To evaluate the importance of organic maturation products during clastic diagenesis, we compared the diagenetic evolution of deeply buried Permian red bed sandstones from areas with and without hydraulic contact to hydrocarbon source rocks in the Central European Basin System. The comparative study of petrography, authigenic mineral chemistry, burial and thermal evolution of reservoir and source rocks suggests that major diagenetic processes are controlled or at least influenced by organic maturation products. Important diagenetic features are spatially related to the presence of maturing hydrocarbon source rocks: the bleaching of red beds, major dissolution events, pervasive illite/chlorite formation, impregnation of pore surfaces with bitumen and formation of late Fe-rich cements. The spatial coincidence of these processes, their timing with respect to organic maturation and the presence of paleo oil (bitumen) suggests that they trace paleo hydrocarbon migration pathways. Cementation patterns can be strongly reorganized in areas affected by hydrocarbon fluids. Other deep basinal compartments, which were not in hydraulic contact to organic rich source rocks, often preserve relatively early burial cements. Combination of 3-D-seismic data with conceptual models of HC migration related pore space modification is an aid in reservoir quality prediction.