

Recrystallization Features in Rock Salt from Polish Zechstein Basin – Preliminary Results of Investigations

Stanisław BURLIGA

Institute of Geological Sciences, Wrocław University, pl. M. Borna 9, 50 – 204 Wrocław, Poland

Polish Zechstein Basin constituted the eastern part of European Zechstein Basin in which huge amount of evaporite deposits accumulated throughout the Late Permian. During subsequent geological periods, the deposits became covered by complex sedimentary sequence of variable thickness and, in places, strongly deformed. Zechstein sediments now occur both in flat-lying, apparently undisturbed settings as well as in the form of complicated salt structures piercing through the Mesozoic cover. This study presents preliminary results of microstructural investigation on rock salt in such two contrasting occurrences: almost flat-lying beds from the marginal part of the basin (Foresudetic Monocline), and a diapiric structure from the central part of the basin (Kłodawa salt structure). The observations were made on rock salt sampled directly in mine excavations, and the techniques applied included analyses of thin sections in transmitted light and of polished, etched sections in reflected light.

Rock salt at both localities shows variable grain size of halite, ranging from 2 mm to 2 cm in diameter. The size may vary at a sample scale as well as at a scale of a set of beds. A similar variation was observed in grain shape fabric: some samples possessed well developed fabric, other poorly visible fabric. The above features indicate that grain size and fabric are most likely controlled by tectonic deformation that affected rock salt. Besides halite, a variable amount of anhydrite and/or potash salt minerals is present in rock salt samples. Recrystallization processes in rock salt are evidenced by two main groups of features: grain shape geometry and its relation to mineral impurities, and internal grain structure.

Thin section study revealed that halite grains have mostly irregular boundaries with lobate interfingering of grains, although euhedral grains are also locally preserved. The boundaries are marked by impurity minerals (when present), which occur either in dispersed form or as relatively continuous films. Apart from intergranular position, anhydrite grains occasionally appear in trails within individual halite grains. The latter is interpreted as a “ghost” grain boundary, evidencing fast boundary migration during halite recrystallization.

Polishing and etching of sections enabled to visualize internal structure of halite grains, thus providing direct evidence for halite recrystallization. The analyses show that most grains contain subgrains of different size, shape and distribution across the grain. Some grains are constituted of very well defined polygonal subgrains and of subgrains with irregular boundaries developed only in a portion of a grain. Some grains do not reveal subgrain structure at all or have a very few subgrains. Grains without subgrains usually have convex shape at boundaries with subgrain-bearing grains, indicating that they are recrystallized phases.

The set of microstructures observed in thin and polished sections of rock salts from the Polish Zechstein Basin suggests that the salt was dynamically recrystallized in places, both in apparently undeformed salt beds and in a diapir structure. Subgrains, impurity trails in halite grains and dispersed potash minerals in rock salt evidence dislocation creep, grain boundary migration and solution transfer as the dominant recrystallization processes operating in salts. The recrystallization was of polyphase character and not uniform.

Decoupling of Deformation between Basement and Cover during Normal- to Reverse-slip Movement on a Basement Fault; Model Results

Stanisław BURLIGA¹, Hemin A. KOYI² and Piotr KRZYWIEC³

¹ *Institute of Geological Sciences, Wrocław University, pl. M. Borna 9, 50 – 204 Wrocław, Poland*

² *Hans Ramberg Tectonic Laboratory, Department of Earth Sciences, Uppsala University, Villavägen 16, Uppsala, Sweden*

³ *Polish Geological Institute, ul. Rakowiecka 4, 00 – 975 Warsaw, Poland*

Many sedimentary basins show two-stage evolution history: an extensional phase followed by basin inversion due to which normal faults were reactivated as reverse faults. A set of sandbox models was built in order to study the geometry and kinematics of structures developed in an evaporite-bearing basin-fill undergoing subsequent extension-shortening events.

Each model consisted of a ductile layer overlain by layers of fine sand. These layers were placed on a rigid basement with an in-built, 60°-dipping fault, which was activated during extension and subsequent inversion. Additional, synextensional sedimentation of sand over the model led to cover thickness variation across the basement fault. During shortening part of