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Correlation between bromine concentrations in halites and their stratigraphical position in Zechstein 2 salt deposits of North-West Europe

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The most important genetic tracer element within salt research is the trace component bromine. In the course of evaporating sea water bromine is implemented into the crystal lattice instead of chlorine. With progressive evaporation the bromine content in the sea water increases as well as in the subsequently formed halite crystals indicating the stage of evaporation. Therefore the bromine content of halite is characteristic for each sequence within a stratum.

Based on detailed investigations in the north German Gorleben salt dome (BORNEMANN et al. 2001), supplemented by samples from the Morsleben salt structure, a standard bromine profile was created, characterizing the progressive and primarily evaporation sequence. The beginning of the salt sedimentation of the investigated Permian Staßfurt-Formation (Zechstein 2) is characterised by very low bromine concentrations of about 29 to 59 μgBr/g halite in the Basissalz (z2BS). Towards the younger units, the stratum of the Hauptsalz follows, divided in Knäuelsalz (z2HS1), Streifensalz (z2HS2) and Kristallbrockensalz (z2HS3). The bromine content varies in the oldest unit (z2HS1) of this sequence from 44 to 115 μgBr/g halite showing a nearly constant running average. Towards the younger unit (z2HS2) the bromine values increase shifting from 50 to 168 μgBr/g halite. The youngest unit (z2HS3) of the Hauptsalz shows distinct increasing bromine values between 94 and 219 μgBr/g halite. This is followed by the much younger Hangendsalz/ Kieseritische Übergangssichten (z2HG/UE), displaying the highest values with a range of 177 to 299 μgBr/g halite.

This bromine standard profile shows an exponential curve from the bottom (z2HS1) to the top (z2HG/UE) characteristically for primary halites crystallised from progressive evaporated sea water. Based on actual knowledge, this typical bromine standard curve, reflecting the stratigraphical position which also allows the identification of synclines and anticlines, is valid for the whole Zechstein 2 Formation (z2, Staßfurt-Formation) of the northern German Zechstein basin. It is very probable that this curve is valid for a broad regional extension (SCHRAMM et al. 2002). The applicability of this method is based on samples from drill cores and cuttings from several salt deposits of northern Germany. Examples from a flat layering salt deposit to a salt dome will be presented. Bromine profiles will be established for adjacent countries, which are partly worked out or in progress.

The bromine analysis can give a stratigraphical allocation and identifies structural elements. This is actually used for example as a tool for exploration drillings in the frame of solution mining.

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