

Fluid inclusions of lower Triassic sea water in halites of the Röt evaporites from eastern Netherlands

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Geochemical investigations of fluid inclusions and their host minerals (halite) were carried out on samples of the relatively less consolidated Röt salt deposit from the Twente-Rijn 480 borehole (Akzo Nobel Salt bv) of eastern Netherlands. Na, K, Ca, Mg, Cl, SO₄, Li, Mn, Fe, Sr, BO₂ and Br concentrations were analysed whereas Br is of special interest (genetic tracer). The aim of this study is to get information about the composition of the lower Triassic sea water and possible rock water interaction reactions.

The analysed fluid inclusions dominantly plot in the upper part of the sylvite field of the Jänecke-Diagram (25°C). They scatter near by the data for primary and secondary fluid inclusions given by [1]. The samples from the hanging layers (Salt D and C) above and below the sheet silicate containing Interbedding C show the highest Mg-concentrations, plotting dominantly near the stability field border of carnallite and sylvite (Q-E). They correlate with the highest Br values of max. 9000 mg/l and with the highest Li concentrations as well. These fluids are derived from a potash seam recycled by pre concentrated sea water, leaching terrigenous sheet minerals what is also indicated by high Fe concentrations. In parts the fluid inclusions are enriched in Li, Fe, Mn and BO₂ in relation to recent sea water and with respect to their evaporation stage: max. 818 mg BO₂/l, 120 mg Li/l, 128 mg Fe/l and 45 mg Mn/l. High Ca concentrations were measured in the fluid inclusions of the Interbedding B and Salt B as well as in the hanging layers of Salt A. High Ca concentrations correlate with high Sr values of magnesite bearing strata. It can be assumed that circulating MgCl₂-rich solutions have reacted with CaCO₃ to magnesite whereby Sr of the Ca-carbonate was emitted into the brine.

The Br concentrations of the host halites in comparison to the corresponding brine display partition coefficients that are different to the known derived from undisturbed progressive evaporation [2]. The partition coefficient shows variations depending on the composition of the brine [3].

The investigated fluid inclusions are particularly derived from recycled potash layers by more or less pre concentrated sea water in contact with sheet mineral bearing strata responsible for unusual high trace element concentrations.

References:

- [1] Kovalevych V., Peryt T.M., Beer W., Geluk M., Halas S. (2002) *Chemical Geology* **182**, 549-563.
- [2] Braitsch O. & Herrmann A.G. (1963) *GCA* **27**, 361-391.
- [3] Siemann M. & Schramm M. (2000) *GCA* **64**, 1681-1693.