Experimental and thermodynamic studies of the Br distribution between brine and chlorine minerals

M.SCHRAMM*

Ferderal Institue for Geosciences and Natural Resources (BGR), Stilleweg 2, 30655 Hannover, Germany (*correspondence: michael.schramm@bgr.de)

Introduction

The distribution of Br between brine and chlorine minerals enables the genetic interpretation of evaporite forming processes. As shown in previous publications, the distribution coefficient (D_{Br}) is not constant [1, 2], depending on the kind of the Br incorporating mineral and the composition of the brine [2]. Therefore a thermodynamic modeling with the software EQ3/6v7.2c [3] was performed.

Results

Experimental investigations have shown that the D_{Br} shifts from higher values in low concentrated solutions to lower D_{Br} values in higher concentrated brines of the system NaCl-NaBr-H_2O as well as in evaporating seawater. A comparable Br distribution was detected in the carnallite- and sylvite-H_2O-system. In order to describe the Br distribution between brine and precipitating halite in a thermodynamic way, different solid solution models [4] were calculated with EQ3/6v7.2c, whereat the trace element solid solution model is the most satisfying one [1, 2] also for the more complex seawater evaporation. According to thermodynamic calculations, the first halite precipitates with a Br concentration of about 0.0075 wt. % in evaporating seawater with a Br content of about 0.054 wt. %. The modeling shows a good analogy with the theoretical Br value of 0.0075 wt. % for the first precipitating halite and the brine (0.053 wt. %) [5] as well as for the halite with 0.018 wt. % Br, that precipitates in a later stage of evaporation while polyhalite forms. The EQ3/6-results for carnallite saturated seawater with respect to the Br content in the solution (0.50 wt. %) and the paragenetic halites (0.037 wt. %) are nearby the theoretical values. Additionally first results for the thermodynamic modeling of the Br incorporation in carnallite will be presented.

[1] Siemann & Schramm (2000) *Geochim. Cosmochim. Acta.* **64**, 1681-1693. [2] Siemann & Schramm (2002) *Geochim. Cosmochim. Acta.* **66**, 1387-1399. [3] Wolery (1992) *EQ3/6 software package, version 7.2c.* [4] Saxena (1973) *Minerals, Rocks and Inorganic Materials* **8**, 188. [5] Braitsch (1962) *Mineralogie und Petrographie in Einzeldarstellungen* **3**, 232.