



Bromide distribution characteristics in bedded and domal rock salts of the Stassfurt formation (Zechstein 2): implications for the influence of salt migration-related processes

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The bromide concentration of halite is an indicator for the degree of evaporation and is used as a stratigraphic marker in salt deposits. The bromide profile of the bedded Stassfurt formation rock salts in the Central European Zechstein Basin is characterized by a continuous increase of the bromide content from base to top, and indicates progressive evaporation of seawater. In contrast, former studies suggested that the bromide distribution in domal salts is more irregular. This raises the questions if such irregularities might be related to secondary processes during salt migration, i.e. if there is a causal relationship between bromide distribution and deformation, or if the various halite types with primarily different bromide contents are responsible for the irregularities. In this study, the bromide distribution of a defined stratigraphic section (Hauptsalz) of the Stassfurt formation was comparatively investigated in 2 salt deposits, with the Teutschenthal deposit consisting of bedded salt and the Gorleben deposit consisting of domal salt. In addition, two different halite types (Kristallbrocken and matrix) were distinguished during sampling.

The comparison between the bedded salt of Teutschenthal and the domal salt of Gorleben reveals that (i) the characteristic trend of the bromide profile was generally preserved in both the bedded and the more intensely deformed domal salt, (ii) the variance of bromide contents is considerably lower in the deformed rock salt, especially in the lower half of the Hauptsalz, and (iii) Kristallbrocken are absent in the lower half of the Hauptsalz of Gorleben, indicating that they have already been subjected

to deformation. Selective sampling of the Kristallbrocken and the matrix halite displays a disparity in the bromide content between the different halite types although they belong to the same stratigraphic horizon. This disparity is not consistent, i.e. the bromide content of the Kristallbrocken is higher in Gorleben and lower in Teutschenthal compared to that of the associated matrix halite. These specific phenomena might be related to the depositional environment or to post-depositional processes, but they cannot be explained conclusively yet.

The lower variance of the bromide contents in the deformed rock salt is a clear indication for the influence of salt migration-related processes on the bromide distribution characteristics. It shows that these processes are associated with a redistribution of bromide, which eventually results in a homogenization of the originally varying bromide contents. On the other hand, the principal preservation of the characteristic trend in the bromide profiles indicates that large-scale brecciation or folding processes played only a minor role during the formation of the Gorleben salt dome.