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Sorption of Ba onto Gibbsite: a batch and modeling study

MR. VIKTOR DÜCK, PHD STUDENT[1], NORBERT JORDAN[1], VINZENZ BRENDLER[2], THORSTEN STUMPF[3] AND FRANK BOK[2]

[1]Helmholtz-Zentrum Dresden Rossendorf e.V., Institute of Resource Ecology

[2]Helmholtz-Zentrum Dresden-Rossendorf e.V.

[3]Helmholtz-Zentrum Dresden-Rossendorf e.V., Institute of Resource Ecology

Presenting Author: v.dueck@hzdr.de

Exposure of radium (Ra) as an example for NORM (Naturally Occurring Radioactive Material) must be avoided to protect people and the environment. For respective prognostic modelling of Ra reactive transport, sorption is an essential process. Here, mechanistic Surface Complexation Models (SCM) can take into account various site-specific geochemical parameters. Currently, SCM data on the sorption of Ra onto naturally occurring aluminosilicates (especially feldspar) is sparse and often derived from the chemical analogues barium or strontium [1-3]. However, there is evidence in the literature that the sorption behavior within the series of alkaline earth metal cations is not as similar as expected [4], which renders the application of such chemical analogies questionable.

To improve the situation, sorption experiments of Ba onto gibbsite were performed as representatives of a mineral with aluminol binding sites. The derived surface complexation parameters will then be used to develop an SCM for Ba sorption onto natural occurring minerals with both aluminol and silanol (here utilizing quartz data) binding site types, namely feldspar. This bottom-up approach will be extended to Sr and Ra as well to evaluate the limitations of the alkaline earth metals chemical analogy in the context of sorption. The models obtained will help to better predict the spread of NORM and reduce conservatism.

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