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# Signs of water-rock interaction in fractured coalmine overburdens – First steps for setting a double-continuum reactive transport model

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Underground hard coal mining tends to redistribute the stress state of the surrounding rock volume, leading to movement, deformation and failure of the rock layers above the mined seam. Overburden disruptions affect subsurface water bodies and their flow conditions. Fractures along the bedrock change the hydrogeological system, altering water flow paths and increasing the surface of rock exposed to water interaction. At the Ibbenbüren West Field this has resulted in elevated iron (>2000 mg/L) and sulfate (≈4000 mg/L) contents. The present study assesses the water-rock interaction and the reactive transport of solutes through the disturbed sedimentary sequence with the aim to identify and quantify relevant key parameters governing mine drainage composition.

The drainage of the Ibbenbüren Westfield is on an elevated position with respect to the surrounding areas. Accordingly, the actual chemical signature may be the result of the interaction between percolating rainwater and the Carboniferous rock sequence above the adit. To test this hypothesis, the present study combines several analytical techniques to identify and characterize evidences of water-rock interaction in the overburden. Petrographic microscopy, Scanning Electron Microscopy (SEM), X-ray diffraction microscopy (XRD) and X-ray fluorescence spectrometry (XRF) are applied on 22 rock intervals belonging to two full diameter core samples pierced above the drainage.

Results are used to set up a conceptual model that establishes the relevance of each flow medium (porous and fractured) in the mine drainage quality. Mining-derived fractures would play an important role by allowing the interaction of meteoric water with the rather low permeable sandstones layers. In such a system, water propagates rapidly through the fractures, while slowly invading the tight matrix blocks. Fluid exchange is achieved by pressure and chemical difference between both mediums. In the next step, our findings will be integrated into a reactive transport model, using TOUGHREACT to forecast the long-term evolution of mine drainage.