SINA 2018

16th STABLE ISOTOPE NETWORK AUSTRIA MEETING

Book of Abstracts

Scientific Organizing Committee

Ronny Boch[1]
Martin Dietzel[1]
Albrecht Leis[2]
Werner E. Piller[3]
Gerfried Winkler[3]

[1]Institute of Applied Geosciences, Graz University of Technology
[2]JR-AquaConSol GmbH, Hydrological Concepts and Solutions
[3]Institute of Earth Sciences, University of Graz

Poster

Origin of mine water and groundwater from the Ibbenbüren coalfield, North Rhine-Westphalia, Germany – interpretation of Sulfur, Oxygen and Hydrogen isotopic ratios

Thomas Rinder[1] & Sylke Hilberg[1]

[1]Department of Geography and Geology, University of Salzburg, Salzburg, Austria

Email: thomas.rinder@sbg.ac.at

Mine dewatering is necessary to allow excavation of hard coal below the groundwater table. After closure this is no longer needed and a mine can be flooded. However, during all operational cycles, coal mine drainage is potentially harmful to the environment. The waters are often acidic, comprise high loads of total dissolved solids and toxic metals, thereby potentially polluting receiving streams and surrounding groundwater reservoirs. Understanding of the chemical evolution of mine waters is a crucial factor for successful mine water management and the mitigation of environmental problems after the closure of the coal mines.

The colliery in the Ibbenbüren coalfield is one of the two last remaining active collieries in Germany. It is planned to close and flood the mine beginning with December 2018. In summer 2018 a sampling campaign of the mine water and groundwater surrounding the coalfield was conducted. A coupled hydrochemical and isotopic approach is applied to identify the processes which govern the chemical evolution of the mine drainage and to understand the hydrogeological framework of the region with the greater aim to facilitate the prediction of the future long-term development.

The carboniferous sedimentary rocks of the Ibbenbüren coalfield host anthracite coal bearing layers, which were brought up to the surface during a tectonic uplift in the Cretaceous. The coalfield is surrounded by Permian, Triassic and Jurassic sediments. Preliminary results show that the isotopic composition of sulfate in waters, that are relatively close to the surface, points to pyrite oxidation as the main source of sulfate, with $\delta^{34}S$ values between -8,3 and +0,3 ‰. In contrast the $\delta^{34}S$ values of the brines in the deepest part of the mine resemble the values of upper Jurassic or mid Triassic evaporites. In this case the infiltration of groundwater from outside of the coalfield is likely. Finally the δD and $\delta^{18}O$ isotopic composition of the brines points to a meteoric origin.