Resource potential of covered hydrothermal mineralizations and formation waters in the North German Basin

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The North German Basin is part of the Southern Permian Basin in Central Europe and is host to significant hydrocarbon deposits. Hence, the basin has been intensely studied in the course of hydrocarbon exploration since the 1950s. Gas exploration activities have drilled numerous carbonate-hosted Pb-Zn and F-Ba mineralizations in the Rotliegend and Hauptdolomite (Ca2) units of the Zechstein as well as in the underlying basement of the Devonian and Carboniferous. Within the BMBF-funded research project "MinNoBeck – Covered Hydrothermal Mineralizations in the North German Basin", these mineralizations are, for the first time, systematically studied in order to gain information on the ages of the mineralizations, on potential fluid sources and on the resource potential of these covered hydrothermal deposits in the North German Basin for high-technology resources such as rare earth elements (REE), F, Ga, Ge and In. Numerous Pb-Zn-F-Ba veins of considerable thickness have been drilled all over the North German Basin during the hydrocarbon exploration activities. Besides Zn, Pb and F, these mineralizations may also contain elevated concentrations of critical high-technology metals such as Ga, Ge, In, and REE.

We present first data on the geochemistry of the vein mineralizations with special emphasis on REE and other associated high-technology metals. The REE patterns of hydrothermal mineralizations are useful geochemical tools for reconstructing the potential fluid- and metal sources and may also provide information on the temperature the mineralizing fluid had experienced. Additionally, formation waters of Zechstein and underlying formations are sampled and analyzed for their major, minor and trace element compositon, including REY. Past investigations of formation waters from, for example, the Rotliegend Altmark gas reservoir in eastern Germany indicated that the formation waters are considerably enriched in the high-technology metal Li and are geochemically comparable to fluid inclusions found in the hydrothermal mineralizations. These high-salinity brines, therefore, may represent an analogue to the hydrothermal fluids from which the (Pb-Zn-)-F-Ba vein mineralizations precipitated.