Lithological detachment surfaces in a German potash mine – an interdisciplinary approach to minimize a longtime safety issue

Anja Dabrowski
TU Bergakademie Freiberg, Germany (Anja.Dabrowski@mineral.tu-freiberg.de)

The detailed knowledge on the geological characteristics and geochemical behaviour of evaporitic rocks is crucial for the safety in potash mining. Evaporitic rocks (e.g. rock salt, sylvinite) are frequently interbedded with thin layers of clay or anhydrite, which are known as detachment surfaces ("Löserflächen"). Those detachment surfaces are attributed as safety issues for decades in the underground potash mining. Due to the convergence of the overburden rocks and the decompression in excavated mine openings, detachment surfaces are preferred zones of structural weakness at the roof of potash mines. The expansion of the present-day mines to greater depths with a higher thickness of overburden rocks demands a revision and re-evaluation of the geological knowledge of detachment surfaces.

My study is based on descriptions and field data from the evaporitic Zechstein basin (Upper Permian) in Central Germany according to Reichenbach (1970). The Central German Zechstein Basin is composed of cyclically deposited saliniferous rocks (limestone – anhydrite – rock salt – sylvinite – claystone) with a normal thickness of about 400 m, followed by Triassic sand- and limestones with a thickness up to 1000 m.

I will focus on detailed stratigraphic, mineralogical and geochemical investigations of the rock salt interval in the Leine evaporitic cycle (Zechstein, Upper Permian). The so-called "Hangendes Begleitsalz" has been deposited subsequent to commercially excavated potash seam "Ronnenberg" with an average thickness of about 10 m (Fig.1). The formation of the "Hangendes Begleitsalz" consists of coarse crystalline halite, interbedded with continuous layers or flaky aggregates of microcrystalline anhydrite. The thickness of the single halite beds is 10 cm to 40 cm with an overall colourless to light grey, sometimes brownish-orange appearance in the upper or lower parts (Reichenbach, 1970). A few anhydrite beds also contain polyhalite, clay and talc. Previous studies have shown that those mixed anhydrite beds are preferred zones of structural weakness. However sufficient knowledge of the geology of detachment surfaces has not been gained so far.

Thus, detailed geoscientific investigations of detachment surfaces will help to increase the safety in mining. The methodical background of my studies includes underground mapping of the "Hangendes Begleitsalz" halite formation linked with close meshed sampling of the detachment surfaces. Mineralogical, geochemical and thin section analyses, supported by scanning electron micrograph (SEM) data will help to determine the quantitative and qualitative mineral content of the samples. The traceability of the detachment surfaces throughout the mining claim will be proven by the re-interpretation and analysis of surface- and underground drilling data as well as underground mapping data.

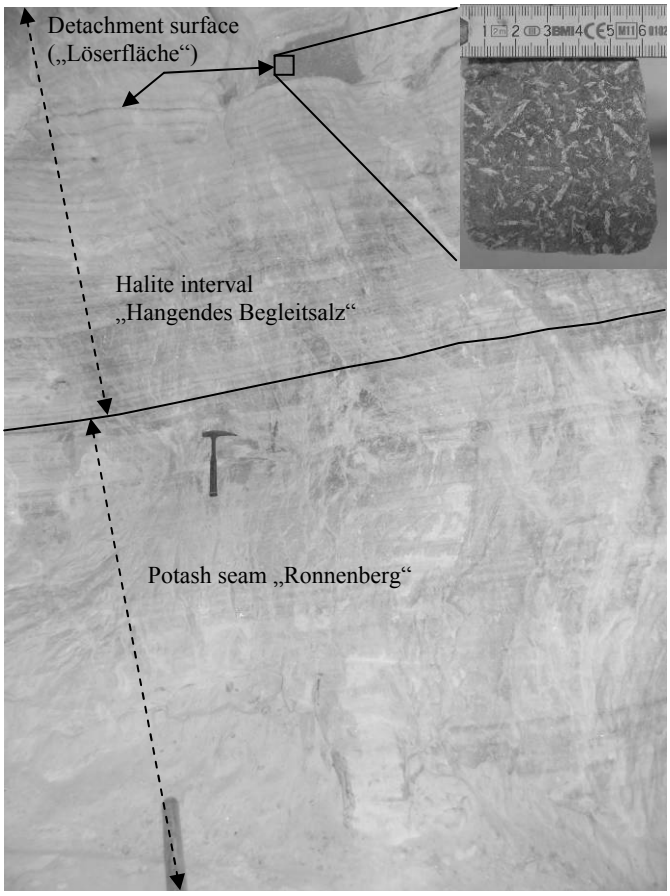

Fig. 1: Potash seam "Ronnenberg" and halite interval "Hangendes Begleitsalz" with detachment surface ("Löserfläche") (Dabrowski, 2013)

Reichenbach, W. (1970): Der Zechstein auf der Scholle von Calvörde – TU Bergakademie Freiberg, 200 p.