

## PROPERTIES OF SVV - A SALT BASED MATERIAL FOR THE SEALING OF CAVITIES IN SALT FORMATIONS

Horst-Juergen Herbert and Uwe Hertes, Gesellschaft fuer Anlagen- und Reaktorsicherheit (GRS) mbH, Braunschweig, Germany

### ABSTRACT

GRS has developed a self-sealing salt backfill material SVV (SVV = **Selbst Verheilender Versatz** = German for self sealing backfill) based on anhydrous magnesium sulphate for the sealing of drifts and boreholes in salt and potash mines. Fine grained dry magnesium sulphate with salt additives like rock salt and/or sylvite can be emplaced pneumatically and flooded with salt brine. The exothermic reaction leads to the formation of a brine tight seal. The reaction consumes the brine completely and forms an impermeable plug with a new mineralogy and higher volume. The volume expansion leads to a considerable crystallization pressure. This process leads to the closure of fractures and of the excavation damaged zone. The initial high porosity of over 50 % is reduced to 2 - 3 vol.-%. The remaining pores are isolated and present no hydraulic conductivity. The new mineralogical assemblage is meta stable at the beginning of the hydration process but is transformed successively in a long term stable phase assemblage. Geochemical modeling allows the quantification of the short- and long-term volume changes in the system and confirms that in the long run stable mineral assemblages will be reached. The porosity/permeability relationship resembles that of highly compacted crushed rock salt backfill. The mechanical properties are comparable with the values of undisturbed rock salt. These results indicate that SVV is a self-sealing long-term stable and predictable sealing material. Whereas most of these properties have already been investigated and reported before, in this paper results of a new large scale in-situ experiment in a vertical borehole in a mechanically disturbed carnallite formation in the Asse salt mine in Germany are presented. It has been demonstrated that not only the SVV seal itself is brine tight but that in addition the SVV sealing material is able to effectively seal of brine path ways in the surrounding rock formation.