



Swelling inhibitors in anhydritic claystone

Timothy Wangler, Stefan Aebersold, Amir Shahab, and Robert Flatt
Institute for Building Materials, ETH Zurich, Zurich, Switzerland

Tunnels through the Gipskeuper have been plagued by floor heave issues for decades, due to the dual problem of swelling clays and crystallization pressure from the anhydrite-to-gypsum transformation [1]. These problems can arise quickly, during construction, as in the case of the Chienberg Tunnel, or develop slowly over years, as has been observed in all tunnels with this problem. Numerous geotechnical solutions have been attempted to mitigate the problem, with limited success. In this work, we present the possibility to use chemicals to reduce clay swelling and inhibit the anhydrite-to-gypsum transition. The suitability of diaminoalkanes, used previously as swelling inhibitors in stone conservation [2], is examined. Additionally, we focus on the affinity of various anhydrite-to-gypsum inhibitors to various calcium sulfate phases via adsorption isotherms to better understand their mechanism of action.

1. Anagnostou, G., Pimentel, E. & Serafeimidis, K. Swelling of sulphatic claystones – some fundamental questions and their practical relevance / . Quellen von sulfatführenden Tonsteinen – Themen der Grundlagenforschung und ihre praktische Bedeutung. Geomech. Tunn. 3, 567–572 (2010).
2. Gonzalez, I. J. & Scherer, G. W. Effect of swelling inhibitors on the swelling and stress relaxation of clay bearing stones. Environ. Geol. 46, 364–377 (2004).