

Hydromechanical behaviour of compacted BKT bentonite during saturation

Renata Adamcova and Magdalena Kondrcova

Comenius University in Bratislava, Faculty of Natural Sciences, Department of Engineering Geology, Bratislava, Slovakia
(renata.adamcova@uniba.sk)

An advanced research of thermo-hydro-mechanical behaviour of some already well-known bentonites for technical barriers in a future deep geological repository (DGR) of radioactive waste is going on in some countries for years. Sophisticated computational methods are used for the assessment of the barrier integrity at the highest research level. However, if the suitability of bentonites from new local deposits should be evaluated, research turns back into the laboratory, to the basic analyses and relatively simple laboratory tests. This is the case of the bentonite BKT produced by the company EnviGeo in Slovakia. This bentonite is sold as a substitute for the earlier studied bentonite from the Kopernica deposit (Adamcova, Frankovska & Durmekova, 2009; Galambos et al., 2011; Gorniak et al., 2016, etc.) in the Central Slovakia. The source of BKT is in the Neogene volcanic Kremnicke Vrchy Mts., as well. Mineralogical analyses of BKT and Kopernica bentonite K45 show quite identical composition, while further analyses and tests (e. g. liquid limit) indicate a better swelling potential of K45 indirectly. High swelling potential is the most important property warranting the barrier „impermeability“, i. e. an extremely low hydraulic conductivity and contaminant isolation. During years mining of the bentonite forwarded to a considerable distance and material properties changed, K45 is no more offered by the supplier. For the exact knowledge of the hydromechanical behaviour of BKT, samples compacted to the same dry density are used for constant-volume swelling pressure tests (in oedometer/consolidometer) and for the suction tests by chilled-mirror method (in the Dew Point PotentiaMeter WP4C, using closed perforated constant-volume sample containers according to Seiphoori, Ferrari & Laloui, 2014). Several sample sets of different dry densities are tested. Wetting water retention curve are constructed for each dry density. Finally, the relation between suction and the swelling pressure will be analysed and the possibility of the prediction of the swelling pressure from the suction tests by WP4C will be discussed. Preliminary test results will be presented, the research is going on. Good knowledge of the properties of suitable local bentonites will be necessary not only for the DGR safety, but also for the future cost analyses. Using local sources means shorter material transport, thus reduction of the environmental impact, as well as development of the local economy.

References

Adamcova, R; Frankovska, J; Durmekova, T.: Engineering geological clay research for a radioactive waste repository in Slovakia. *Acta Geol Slovaca*, 1, 2, 2009, 71-82

Galambos, M.; Rosskopfova, O.; Kufcakova, J.; et al.: Utilization of Slovak bentonites in deposition of high-level radioactive waste and spent nuclear fuel. *J. of Radioanalyt. and Nucl. Chem.*, 288, 3, 2011, 765-777

Gorniak, K.; Szydlak, T.; Gawel, A.; et al.: Commercial bentonite from the Kopernica deposit (Tertiary, Slovakia): a petrographic and mineralogical approach. *Clay Minerals*, 51, 1, 2016, 97-122

Seiphoori, A.; Ferrari, A.; Laloui, L.: Water retention behaviour and microstructural evolution of MX-80 bentonite during wetting and drying cycles. *Géotechnique*, 64, 9, 2014, 721-734