



Hydraulic permeability of bentonite-polymer composites for application in landfill technology

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Bentonites are often used as barrier materials in landfill technology to prevent infiltration of leachates to the natural environment. Since decades, geoenvironmental engineering aims at improving the hydro-mechanical performance of landfill liners. Various studies on the permeability performance of geosynthetic clay liners (GCLs) show effects of non-standard liquids on behaviour of Na⁺-bentonite regarding its sealing capacity. With increasing concentration of chemical aggressive solutions the sealing capacity decreases (Shackelford et al. 2000). An opportunity to improve the hydraulic permeability of the bentonites is the addition of polymers.

The changes in hydraulic permeability performance of polymer treated and untreated bentonites while adding chemical aggressive solutions were studied by several authors. Results obtained by Scalia et al. (2014) illustrate that an increase in permeability can be prevented by adding polymer to Na⁺-bentonite. On the other hand, Ashmawy et al. (2002) presented results on the incapability of several commercial bentonite-polymer-products. The objective of this study is to characterize the influence of polymer addition on hydraulic performance of Na⁺-bentonite systematically.

Therefore, the influence of 1% polymer addition of cationic and anionic polyacrylamide on the swelling pressure and hydraulic permeability of MX 80 bentonite was investigated. Preparation of bentonite-polymer composites was conducted (1) in dry conditions and (2) using solution-intercalation method. Experiments on hydraulic permeability were carried out using distilled water as well as CaCl₂-solution.

References

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