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Effect of wet-dry cycles and cation exchange on gas permeability of geosynthetic clay liners

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Author(s): Bouazza A (Bouazza, Abdelmalek), Vangpaisal T (Vangpaisal, Thaveesak), Jefferis S (Jefferis, Stephen)

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Abstract: A series of gas permeability tests were performed on a partially hydrated needle punched geosynthetic clay liner (GCL) after exposure to wet-dry cycles and ion exchange. To be able to evaluate the effect of wetting and drying cycles combined with the effect of cation exchange, three sets of GCL samples were prepared with different types of hydrating liquid. The first set of GCL samples was hydrated with de-ionized water, which formed a baseline test series. The second and third sets were hydrated with 0.0125 and 0.125 M calcium chloride (CaCl₂) solutions, respectively. All three sets of GCL samples were subjected to multiple wetting and drying cycles before undergoing gas permeability tests. Gas permeability of the GCL, hydrated with 0.0125 M calcium chloride solution, was found to be approximately one order of magnitude higher than that of the GCL hydrated with de-ionized water, whereas gas breakthrough flow was observed for all but the first wetting cycle on GCLs hydrated with the stronger 0.125 M calcium chloride solution.

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Reprint Address: Bouazza, A (reprint author), Monash Univ, Dept Civil Engn, Bldg 60, Melbourne, Vic 3800 Australia

Addresses:

1. Monash Univ, Dept Civil Engn, Melbourne, Vic 3800 Australia
2. Ubon Ratchathani Univ, Ubon Ratchathani 34190, Thailand
3. Univ Surrey, Sch Engn, Guildford GU2 7XH, Surrey England
4. Environm Geotech Ltd, Oxford, England

E-mail Addresses: malek.bouazza@eng.monash.edu.au, thaveesak.v@ubu.ac.th, egl@environmentalgeotechnics.com

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