

AN EVALUATION OF OSMOTIC TECHNIQUE UNDER ULTRAVIOLET GERMICIDAL IRRADIATION EXPOSURE

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ABSTRACT: The osmotic technique, which uses polyethylene glycol (PEG) solutions of varying concentrations with semipermeable membranes of different molecular weight cutoffs (MWCO), is commonly used to apply suction in soils. Cellulose acetate membranes which are most commonly used, are susceptible to microbial attacks. This in turn will lead to the intrusion of PEG into soil specimens. Osmotic and vapour equilibrium techniques are often used to establish drying suction-water content soil-water characteristic curves (SWCC). In this study, suctions of 0.11 to 300 MPa were applied on Andrassy bentonite slurries. At higher applied suctions, the osmotic tests were carried under short length ultraviolet germicidal irradiation (UVGI). In addition, Atomic Force Microscopy (AFM) and Fourier Infrared (FTiR) were employed to evaluate the changes in the semipermeable membranes and PEG molecules, respectively. The water content of the clay obtained from the osmotic tests was found to be greater at the overlapping suction region. Interestingly, under UVGI exposure, the water content was found to be in good agreement with the water content determined using the osmotic technique at low suctions and the vapour equilibrium technique at higher suctions. FTiR spectrum and AFM results revealed that some changes had occurred on both the PEG and in the membrane pore sizes. However, these changes did not affect the final water content in the bentonite and therefore, more precise suction-water content SWCC for the clay could be established.

Keywords: Clay, Suction, Osmotic, Microbes, PEG, UV, Cellulose Acetate