含非水相液體土壤之透水性

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摘要

本研究的主要目的在於以壓力儀及滲透儀試驗方法以及 Van Genuchten 經驗公式，瞭解當非水相液體侵入土壤中時，水與有機液體在土壤中的互制行為。試驗採用的土壤為渥太華砂及寶二水庫現地土樣；所採用的有機液體為九五無鉛汽油、柴油及庚烷。

實驗結果顯示：進行壓力儀試驗時，試驗土壤的顆粒越小，由於水具有佔據小孔隙的能力，所以水的殘餘量會隨之增加。另外不同的有機液體，與水的界面張力越大則同一張力下水的殘餘量也會變大。進行滲透儀實驗時，在相同的體積含水比之下，與水界面張力越大則水之滲透係數越小；另外試驗土壤的顆粒越小，相對的滲透係數也會跟著越小。

以經驗公式預測水之滲透係數值，較為準確的為滲透儀保持曲線所得之結果，而比例原則所推得之結果較不理想。然而在同一個體積含水比之下，三條曲線所得之結果與實驗值之差異均在同一個數量級之內，就大地工程上應用來說，仍是可以接受的範圍。

Water Permeability of Soils Partially Saturated by LNAPL

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Abstract

The main purpose of this study is to understand the hydraulic behavior between water and Non Aqueous Phase Liquid (NAPL) in soils partially saturated by NAPL. Tempe cells were used to determine the Soil Water Characteristic Curve (SWCC) and custom-made fix-wall permeability cells were used to determine the hydraulic conductivity in soils. The soils used in the study were Ottawa sand and Bow Shan sand. The NAPLs used were 95 gasoline, diesel, and heptane.

The results of Tempe cell test showed that the larger the soil particles, the less the residual water content. In addition, the liquids with higher surface tension seem to have a better ability to remain in the soils.

The results of permeability test showed that the liquids with higher surface tension of water have smaller water permeability at a given water volumetric content. In the other hand, the smaller the soil particles, the smaller the water permeability.

To predict water permeability with Van Genuchten empirical formula with using SWCC data obtained during permeability test is more accurate. There is the largest difference between the results using scaling rules and the experimental data . However at a given water volumetric content, the results using empirical formula to predict water permeability and the experimental data is at the same order of magnitude. Therefore the results of using empirical formula to predict water permeability is acceptable when the results is applied to geotech engineering.