

## 頁岩風化不飽和土壤之土壤水分特性曲線

范嘉程\* 黃俊龍

**摘要** 本研究為探討不飽和頁岩風化土壤之土壤水分特性曲線 (SWCC), 並與土壤風化程度進行關聯性探討, 另以 FX 模式 (Fredlund and Xing, 1994) 求取頁岩風化土壤之土壤水分特性曲線數學模式參數 ( $a$ ,  $m$ ,  $n$ )。本研究利用壓力鍋試驗探討不同深度頁岩風化土壤之土壤水分特性曲線, 並進行風化土壤篩分析試驗。研究結果顯示風化程度影響土壤水分特性曲線, 粗顆粒含量較多情況, 於低吸力範圍時, 孔隙中水分即開始排出。頁岩風化土壤之 FX 數學模式  $a$  值約為 7~9 kPa;  $n$  值約為 1~1.27;  $m$  值約為 0.385~0.42。文中建立頁岩風化土壤粒徑分佈曲線特性及物理性質與土壤水分特性曲線 FX 模式參數 ( $a$ ,  $m$ ,  $n$ ) 之關係, 參數  $a$  值與初始孔隙比  $e$  呈現反比關係, 參數  $m$  值與有效粒徑  $D_{10}$  成正比關係, 進氣吸力值與有效粒徑  $D_{10}$  成反比關係, 參數  $n$  值則與粒徑分佈曲線中央區域斜率呈正比關係。

**關鍵詞**: 頁岩風化土壤、土壤水分特性曲線、土壤粒徑分佈曲線、壓力鍋。

## The Soil-Water Characteristic Curve for Residual Soils Formed from Shale

Chia-Cheng Fan\* Chuan-Lung Huang

**ABSTRACT** This research aims to examine the Soil-Water Characteristic Curve (SWCC) for residual soils formed from shale formation, and the relevance of the SWCC and the degree of weathering are discussed. The FX model (Fredlund and Xing, 1994) is used to describe the Soil-Water Characteristic Curve of the residual soil, and the parameters ( $a$ ,  $m$ ,  $n$ ) in the FX model are back-calculated. A pressure plate apparatus is used to obtain the SWCC for the residual soils at various depths. In addition, the soil particle distribution curve is drawn for the residual soil. The degree of weathering affects the SWCC of the residual soil. Water may dissipate more readily in the pore at low suctions for the soil with a higher percentage of coarse particles.  $a$  parameters,  $n$  parameters, and  $m$  parameters, used in the FX model, for the residual soil formed from shale are 7~9 kPa, 1~1.27, and 0.385~0.42, respectively. The relationship between the characteristics of the soil particle distribution curve and the physical properties and parameters ( $a$ ,  $m$ ,  $n$ ) of the FX model is established in this paper. The parameter “ $a$ ” in the FX model decreases with increasing initial void ratio of the soil. Parameter “ $m$ ” increases with the effective size  $D_{10}$ . Air-entry values decrease with the effective size  $D_{10}$ . The parameter “ $n$ ” in the FX model increases with the slope gradient at the middle portion of the soil particle distribution curve.

**Key Words**: Residual soils, soil-water characteristic curve, soil particle distribution curve, pressure plate test.