

## 反复干湿循环对非饱和土的力学特性影响研究

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## Influence of repeated drying and wetting cycles on mechanical behaviors of unsaturated soil

摘要

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**摘要** 通过非饱和土三轴仪测试黏土试样经过多次吸湿-脱湿循环路径后的力学特性, 研究反复干湿循环对非饱和土变形和强度特性的影响效应。试验结果表明: 干湿循环使SWCC产生变化, 相同含水率所对应的基质吸力减小; 收缩特性亦发生改变, 干湿循环后试样在基质吸力增加的开始阶段(收缩屈服前)收缩性增强, 屈服后收缩特性基本与循环前一致; 非饱和土固结屈服后的压缩指数增高, 但增高的幅度随基质吸力增大而降低; 有些试样经过干湿循环后, 剪切时产生了滑裂破坏面, 其应力-应变关系表现有明显峰值和应变软化特征; 吸湿-脱湿循环过程不仅使非饱和土有效内摩擦角降低, 而且对吸力内摩擦角值产生一定影响。说明非饱和土经过反复干湿循环的应力路径后, 其力学特性将产生不可逆转的变化。

**关键词:** 非饱和土 反复干湿循环 土水特征曲线 变形 抗剪强度

**Abstract:** A series of tests are performed to measure the variation of deformation and shear strength of unsaturated clays subjected to repeated drying and wetting cycles so as to study the effect of repeated drying and wetting cycles on unsaturated soil by using unsaturated triaxial apparatus. The test results show: firstly, the matric suction of the same soil moisture in SWCC reduces, and shrinkage behaviors of soil enhance during the pre-yield stage of shrinkage and do not change approximately during the post-yield stage of shrinkage; secondly, the compression index increases during the post-yield stage of isotropic compression, and the influence on compression behavior decreases with the increasing suction; and thirdly, a few samples subjected to repeated drying and wetting cycles exhibit a slide plane in triaxial shear tests. Consistently, the stress exhibits an obvious peak value and then decreases sharply with the increasing strain. In addition, repeated drying and wetting cycles not only decrease the triaxial shear coefficient but also have an effect on coefficient with respect to matric suction to a certain extent. It indicates that the change of mechanical properties is irreversible after the unsaturated soil is subjected to repeated drying and wetting cycles.

**Keywords:** unsaturated soil repeated drying and wetting cycles soil-water characteristic curve deformation shear strength

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