岩石力学与工程学报 2004 23 (03): 408 ISSN: 1000-6915 CN: 42-1397/O3

高应力作用界面剪切性质的试验研究

刘希亮1，2 朱维申2 李术才2

(1焦作工学院土木建筑工程系 焦作 454000) (2山东大学岩土工程中心 济南 250061)

收稿日期 2002-8-27 修回日期 2002-11-13 网络版发布日期 2007-4-26 接受日期 2002-8-27

摘要 通过在DRS-1型微机高压直残剪试验系统上所进行的不同土质与不同基底的界面剪切特性试验研究表明：高应力作用下不同结构接触面的峰值强度、残余强度与正应力之间符合库伦强度准则；基底性质对标准砂的抗剪峰值强度准则影响较小，但对其抗剪残余强度准则影响较大；混凝土界面下残余抗剪强度准则的选择与法向应力的大小有关，法向应力较低时剪切破坏发生在砂土中，法向应力较高时剪切破坏发生在界面上，而对于其他基底的剪切破坏始终发生在界面上；标准砂在剪切过程中的体积应变-剪切位移关系，呈现出应变硬化现象整体符合双曲线模型，表现为剪缩性。试验数据的直观分析和方差分析表明：对于残余强度和初始剪切刚度，法向应力是第一影响因素，其次是土体的性质，第三是界面的基底性质，剪切速率的影响最小。

关键词 土力学,高应力作用,界面抗剪强度,井壁破裂

分类号

TESTING STUDY ON INTERFACE SHEAR PROPERTIES UNDER HIGH PRESSURE

Liu Xiliang1，2，Zhu Weishen2，Li Shucai2

(1Department of Civil Engineering，Jiaozuo Institute of Technology， Jiaozuo 454000 China)
(2Center of Geotechnical Engineering，Shandong University， Jinan 250061 China)

Abstract

The direct shearing test on characteristics of interfaces were conducted on the DSR-1 computerized high stress direct/post shearing system for standard sand，building sand，silt and clay interfaced with concrete，smooth metals and rough metals，respectively. The results show that the relationships between the normal stress and the peak shear strength，as well as between the normal stress and the residual shear strength are in accord well with Mohr-Column strength criterion under high stress，and the base influence is weak on the peak shear strength criterion of standard sand，but strong on the residual one. The residual shear strength criterion of concrete-base is related to the value of normal stress. When the normal stress is less than 2.44 MPa，shear failure takes place in standard sand，and when the normal stress is more than 2.44 MPa，the failure takes place on the interfaces. The shear failure of other base always happens in the interface. The curve of volumetric strain-shearing displacement in the shearing course of standard sand shows that when normal stress is less than 4 MPa，the curve appears as yield platform，and when it is more than 4 MPa，the curve presents hardening phenomenon according with the hyperbolic model and the corresponding volume change is contractive. The variance and direct-viewing analysis of the test data show that the normal stress is the main factor，soil property is the second one，roughness of base is the third one，and shearing rate is the fourth one to affect residual shear strength and initial shear stiffness.

Key words soil mechanics,high pressure,shear strength of interface,breaking of well rim

DOI:

通讯作者