



## 论文摘要

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## 复杂节理面剪切强度和变形特征的数值分析

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**摘要:** 采用FLAC<sup>3D</sup>软件建立三维节理试样模型, 分析不同表面形态和边界条件对节理强度和变形特征的影响。研究表明: 当节理面起伏角较小时, 试样剪切强度与正应力之间符合Mohr-Coulomb线性关系, 起伏角对内摩擦角的影响大于对黏结力的影响; 随着起伏角的增大, 剪切强度与正应力之间逐渐呈非线性关系特征; 通过抛物线方程对其进行拟合, 可得到较高的相关性, 并且节理的破坏模式从滑移破坏转变为沿节理面滑移和锯齿压剪碎裂的复合破坏; 峰值强度与残余强度之比随正应力的增大而逐渐减小, 减小趋势符合指数规律, 同时, 试样的各向异性逐渐减弱, 剪切刚度不断增大。

**关键字:** 节理; 剪切强度; 变形特征; 数值分析

## Numerical analysis for shear strength and deformation characteristic of joint plane with complicated surface

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**Abstract:** The three dimensional numerical model for rock sample with joint plane was built by FLAC<sup>3D</sup> software, and the effects of different surface shapes and boundary conditions on the shear strength and deformation characteristic of joint plane were analyzed. The analysis results show that, when the undulating angle of joint plane is small, the relationship between shear strength and normal stress is in accordance with Mohr-Coulomb linear criterion. The effect of the undulating angle on cohesion is in larger magnitude than that of undulating angle on friction angle. With the increase of undulating angle, the relationship between shear strength and normal stress is transferred to the non-linear criterion, which can be fitted by parabolic equation with high correlation coefficient, and the failure mode of joint changes from slipping along joint plane to the compound failure model consisted of slipping failure along joint plane and crushing failure through saw tooth. The ratio of peak strength to the residual strength decreases with the increase of the normal stress, and the relationship between them is in accordance with the exponential equation, while the degree of anisotropic characteristic for joint sample decreases, and shear stiffness increases.

**Key words:** joint; shear strength; deformation characteristic; numerical analysis

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