

扩展功能

本文信息

- ▶ [Supporting info](#)
- ▶ [PDF\(372KB\)](#)
- ▶ [\[HTML全文\]\(0KB\)](#)
- ▶ [参考文献](#)

服务与反馈

- ▶ [把本文推荐给朋友](#)
- ▶ [加入我的书架](#)
- ▶ [加入引用管理器](#)
- ▶ [复制索引](#)
- ▶ [Email Alert](#)
- ▶ [文章反馈](#)
- ▶ [浏览反馈信息](#)

相关信息

- ▶ [本刊中 包含 “岩石力学; 三轴压缩; 塑性变形; 损伤岩样; 能量消耗” 的相关文章](#)
- ▶ [本文作者相关文章](#)
- [苏承东](#)
- [张振华](#)

# 大理岩三轴压缩的塑性变形与能量特征分析

苏承东<sup>1</sup>, 张振华<sup>2</sup>

(1. 河南理工大学 能源科学与工程学院, 河南 焦作 454010; 2. 南阳理工学院 机电工程系, 河南 南阳 473004)

收稿日期 2007-6-15 修回日期 2007-8-20 网络版发布日期 2008-2-28 接受日期 2008-2-15

**摘要** 利用伺服试验机对大理岩岩样在不同围压下轴向压缩屈服之后完全卸载, 再对损伤岩样进行的单轴压缩试验, 研究岩样不同围压下三轴压缩的塑性变形量、能耗与损伤岩样单轴压缩时的强度、平均模量、能耗特征的变化规律。研究表明, 大理岩具有明显的脆性-延性转化特征, 围压较高时应力-应变曲线出现屈服平台, 岩样塑性变形持续增加, 而裂隙通过摩擦力使岩样承载能力基本保持不变。岩样三轴压缩过程中屈服前能量消耗较少, 塑性变形过程需要消耗更多的能量, 塑性变形与耗能具有良好的线性特征, 高围压下要使岩样完全破坏需要消耗较多能量。损伤岩样单轴压缩时的强度、平均模量与三轴压缩的塑性变形大致线性降低, 低围压下产生的塑性变形对强度、平均模量的影响显著。峰后屈服弱化阶段岩样承载能力的降低与塑性变形的增加近似成线性关系, 弱化模量与强度没有明显关系, 表现出损伤岩样明显局部化破坏特征。

**关键词** [岩石力学](#); [三轴压缩](#); [塑性变形](#); [损伤岩样](#); [能量消耗](#)

分类号

## ANALYSIS OF PLASTIC DEFORMATION AND ENERGY PROPERTY OF MARBLE UNDER PSEUDO-TRIAxIAL COMPRESSION

SU Chengdong<sup>1</sup>, ZHANG Zhenhua<sup>2</sup>

(1. School of Energy Science and Engineering, Henan Polytechnic University, Jiaozuo, Henan 454010, China;  
2. Department of Electromechanical Engineering, Nanyang Institute of Technology, Nanyang, Henan 473004, China)

### Abstract

Triaxial compression experiments are carried out for marble specimens by servo-controlled testing machine. After the specimens failed, they were then completely unloaded, and then uniaxial compression tests were carried out for the damaged rock specimens. Based on the experimental results, the plastic deformation and energy properties of marble specimens are analyzed under different confining pressures. At the same time, the uniaxial strength, elastic modulus and energy property of damaged specimens after unloading are investigated. The results show that marbles process the clear BDT(brittle-ductile transformation) property. The stress-strain curve shows the yield platform under higher confining pressure, i.e. the plastic deformation of rock specimen continues to increase with the axial deformation, but the supporting capacity by friction keeps basically a constant. The dissipated energies of rock specimens before yielding are comparatively less in the process of triaxial compression, but more energies in the process of plastic deformation. Moreover, the plastic deformation of rock specimen has a good linear relationship with the dissipated energy. Under high confining pressure, rock specimen will dissipate more energy in order to make the specimen fail completely. The strength and elastic modulus of the damaged specimens decrease linearly with the increase of plastic deformation. The produced plastic deformation under lower confining pressure has distinct effect on the strength and elastic modulus. However, in the yielding and softening phases after peak strength, the decrease of the supporting capacity of rock specimen is linearly accorded with the increase of plastic deformation. The softening modulus and elastic modulus of damaged specimens have no clear relationship with the peak strength, showing the localized behaviors of failure.

**Key words** [rock mechanics](#); [triaxial compression](#); [plastic deformation](#); [damaged](#)

DOI:

---

通讯作者