

## 高强钢弹对花岗岩正侵彻的实验研究

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**摘要** 在压缩气体炮上开展了系列高强钢弹对花岗岩正侵彻的模型实验, 获得了侵彻深度与侵彻速度的关系, 建立了可用于高强度岩石侵彻深度预测的经验公式, 该公式与实验结果一致性良好。同时, 分析了模型实验靶体横向尺寸效应, 对于一定尺寸的弹、靶体, 存在确保数据有效的侵彻速度上限; 估算了侵彻时靶体强度, 侵彻时花岗岩强度高出其单轴抗压强度好几倍; 采用能量守恒原理估算了侵彻过程中平均减速度, 与数值模拟结果一致性良好; 在材料试验机上开展了静态侵彻实验, 静态侵彻未能实现深侵彻, 这说明碰撞产生的应力波是实现深侵彻的关键因素。

**关键词** [爆炸力学; 侵彻; 长杆弹; 花岗岩; 模型实验; 减速度; 强度](#)

分类号

## PENETRATION EXPERIMENTS FOR NORMAL IMPACT INTO GRANITE TARGETS WITH HIGH-STRENGTH STEEL PROJECTILE

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### Abstract

A series of normal penetration experiments into granite targets with high strength steel projectiles are conducted using light gas gun. The diameter of projectiles is 15 and 20 mm. The final depth of penetration versus striking velocity is acquired, and a new empirical penetration equation is established accordingly. The final depth of penetration predictions from the new penetration equation is identical with experiments. As indicated by experiments, when the striking velocity is about 900 m/s, the projectile is bent. Target dimension effect of scale-model experiments is analyzed. For obtaining availability data, the maxima dimension of projectile must be restricted for a fixed dimension target. The dynamic strength of granite target is estimated, which is many times larger than the unconfined compressive strength. The rigid-body average deceleration is estimated using the law of conversation of energy, and it is in good agreement with numerical results. Static penetration experiment with high-strength steel projectile also is conducted, and the depth of static penetration is very small. It indicates that the stress wave stirred by striking is very important for penetrating.

**Key words** [mechanics of explosion; penetration; long-rod projectile; granite; scale-model experiment; deceleration; strength](#)

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