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锚杆锚固质量无损检测中的激发波研究

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摘要 采用数值模拟和实验模拟的方法对锚杆－锚固体系中的波动特征进行研究。数值模拟和实验模拟都表明在一般测试激发波的频率范围内锚杆以及锚固体系中传播的波是导波，在不同频率时波的传播速度、波的衰减特性都不同。在锚固锚杆中存在最佳激发波，它能使波传播衰减最小传播距离最长。通过数值模拟的方式找到了对于实验室的锚固锚杆模型能使底端反射清晰可见的最佳激发波。据此定制了实验装置及传感器，实验结果与数值模拟取得了很好的一致性。实验和数值模拟都证明采用最佳激发波可以大大增加锚杆锚固质量检测中的测试深度。

关键词 岩石力学 导波 锚固质量 最佳激发波

分类号

STUDY ON OPTIMUM EXCITATION WAVE IN GROUT QUALITY NONDESTRUCTIVE TESTING OF ROCK BOLT

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Abstract

Numerical simulation and experimental testing are used to study wave propagation characteristics in grouted rock bolt. Both show that the waves which propagate in grouted rock bolt are guided waves and different frequencies have different wave velocities and attenuation characteristics. There is an optimum excitation signal which has smallest attenuation in the grouted structure and can propagate for longest distance in the grouted rock bolt. The optimum excitation signal for our experimental grouted structure which makes clearest end reflection is firstly found by numerical simulations. And then the experimental set-up and transducers are made and the experiment testing results agree well with the numerical simulation showing that the optimum excitation signal can increase greatly the penetration range of ultrasonic wave greatly.

Key words rock mechanics guided wave grout quality optimum excitation wave

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