

论文

深部厚顶煤巷道大型地质力学模型试验系统研制与应用

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摘要:

为研究深部厚顶煤巷道围岩应力演化规律与变形特征, 研制了大型地质力学模型试验系统。该系统由反力装置、柔性均布压力加载装置、数字智能液压控制系统和高精度多元实时监测系统组成, 具有可自由拼装、模拟空间大、荷载集度高、边界加载均匀和模拟精度高等特点。以赵楼煤矿3302工作面运输巷为工程背景, 通过大量的相似材料配比及力学参数测试, 确定了两种不同系列的材料分别模拟砂岩和煤层; 设计制作了预应力锚杆(索)、箱型支护梁、钢带及托盘等相似构件; 对让压型锚索箱梁支护系统进行了大比尺模型试验研究, 得到了深部厚顶煤巷道开挖支护过程中的围岩内部应力演化与变形规律。结果表明, 该系统能够较好的进行深井煤巷及其他大型地下硐室开挖支护全过程的模型试验研究。

关键词: 厚顶煤巷道; 地质力学模型试验; 大比尺; 柔性均布压力加载装置; 应力演化; 变形特征

Development and application of large-scale geomechanical model test system for deep thick top coal roadway

Abstract:

To study the surrounding rock stress evolution laws and deformation features of deep roadway with thick top coal, a large-scale geomechanical model test system was newly developed. This test system mainly consists of counterforce device, flexible uniform pressure loading device, digital intelligent hydraulic control system and high precision pluralistic real-time monitoring system. This flexible assembled system has large space for simulating, can provide high and uniform loading which can increase test precision. Taking 3302 working face of Zhaolou Coal Mine as engineering background, according to a large number of similar material compounding tests, two kinds of similar materials belong to deferent series were determined to simulate sandstone and coal respectively. Similar supporting components such as prestressed bolt(cable), box supporting beam, steel strip, and steel tray were designed and manufactured; the large-scale model test reseach was carried out on pressure relief anchor box beam support system, and the surrounding rock stress evolution and deformation laws in excavating and supportting of deep roadway with thick top coal was obtained. Results show this system can be preferably used for excavte-support model test of deep coal roadways and other large scale chambers.

Keywords: thick top coal roadway; geotechnical model test; large-scale; flexible uniform pressure loading device; stress evolution; deformation characteristic

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