

不同瓦斯压力条件下原煤剪切破裂细观特征试验研究

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EXPERIMENTAL STUDY OF CRACK'S MESO-CHARACTERISTICS OF RAW COAL SUBJECTED TO DIRECT SHEAR LOAD UNDER DIFFERENT GAS PRESSURES

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摘要

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摘要 利用自主研发的含瓦斯煤岩细观剪切试验装置,开展不同瓦斯压力条件下原煤在剪切荷载作用时裂纹演化细观特性试验研究,分析裂纹开裂扩展与形态演化模式及其受瓦斯压力的影响规律。研究表明:煤岩裂纹的开裂扩展及破坏后形态受其原始裂纹影响;分析放大素描图发现,最终形成的宏观破裂是由一系列倾斜裂纹(主要从左下角至右上角)在剪切荷载作用下贯通形成的,并且随着瓦斯压力的增加,倾斜裂纹的扩展范围增大。不同瓦斯压力下剪切荷载-剪切位移曲线和开裂荷载水平Pk及贯通荷载水平PG对比分析表明,随着瓦斯压力增加,煤岩损伤加大,破裂加剧,完整性降低,开裂后破坏速度加快;对裂纹的开裂角度分析发现,在没有原始损伤的区域开裂时,裂纹开裂方向与剪切荷载作用方向呈一定角度相交但随着瓦斯压力的增加有减小的趋势,最终形成的宏观破坏方向也不完全与剪切荷载作用方向一致,而以一定角度相交。

关键词: 采矿工程 含瓦斯煤 剪切荷载 裂纹 细观

Abstract: Using self-developed meso-shear test equipment for coal or rock containing gas, tests of meso-characteristics of crack's evolution of coal subjected to direct shear load under different gas pressures, were carried out to reveal general law of crack's evolution and influence of gas on crack's evolution. The results show that initial cracks nearby shear plane crazed firstly when at small angle to the direction of shearing. The principal displacement fracture is formed by transfixion of series of declined cracks(mostly from bottom left corner to top right corner) at various angles to the direction of shearing. Extension of these declined cracks increases as gas pressure increases. From shear load-shear displacement curves, and comparison analysis between level of cracking load Pk and level of transfixing load PG, conclusion was obtained that coal damaged to failure after crack craze more and more quickly as gas pressure increases because of fragmentation caused by gas. The angles of cracks show that cracks originated from non-crack area have small angles to the orientation of shear load; and mean angle decreases with the increasing gas pressure. The finally formed principal displacement fracture didn't parallel to the orientation of shear load, a certain angle existed.

Keywords: mining engineering coal containing gas shear load crack meso-scale

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