

论文

基于多物理场耦合的瓦斯抽放半径确定方法

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摘要:

为了确定合理的瓦斯抽放半径, 建立了考虑煤的流变特性、渗透率动态变化和吸附特征的渗流-应力耦合模型, 对比分析了软硬煤层钻孔孔径变化规律, 研究了抽放过程渗透率的动态演化规律, 确定了软硬煤层的有效抽放半径, 找出了瓦斯抽放半径的影响因素。研究表明: 由于含瓦斯煤的流变特性, 软硬煤层钻孔均会随时间发生缩孔现象, 软煤层钻孔在短时间内就可能被堵塞, 硬煤层钻孔直径虽有缩小但仍处于稳定状态, 并不堵塞瓦斯抽放通道, 在确定抽放半径时, 应首先分析钻孔的孔径变化规律以确定有效抽放时间; 瓦斯抽放过程煤的渗透率会随时间逐渐增大; 煤体硬度、埋藏深度、初始瓦斯压力、初始渗透率和钻孔孔径等是影响瓦斯抽放半径的主要因素。

关键词: 瓦斯抽放半径; 多物理场耦合; 渗流场; 应力场; 流变特性; 软硬煤

Determination method of gas drainage radius based on multi physics coupling

Abstract:

In order to determine reasonable gas drainage radius, the hydro mechanical coupling model considering rheological properties, permeability dynamics and the adsorption characteristics had been developed in this study. Therefore, the borehole aperture variations of hard and soft coal seam were comparatively analyzed, the dynamic evolution of penetration was studied, the effective gas drainage radius in hard and soft coal seams were determined, and the main influence factors of gas drainage radius were found. The results show that: shrinkage phenomenon of borehole in hard and soft coal seam occurs over time because of rheological properties, the borehole in soft seam will be blocked in a short time, although the borehole diameter in hard coal seams reduces, but borehole is still in stable condition, the gas drainage channel is not blocked. It is necessary to analyze borehole aperture variation and determine effective drainage time before determining gas drainage radius. Coal permeability during gas drainage is gradually increasing -over time. The main influence factors of gas drainage radius is: coal hardness, burial depth, initial gas pressure, initial permeability and hole diameter.

Keywords: gas drainage radius; multi physics coupling; seepage field; stress field; rheological properties; soft and hard coal

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