

论文

双承压水间采煤顶底板破断及渗流规律

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摘要:

以山西某煤矿双承压水间下组煤开采为背景, 针对煤岩应力-渗流耦合机理, 采用相似材料模拟和离散元数值模拟, 揭示双承压水间下组煤不同开采尺度下岩体断裂模式和渗流规律, 提出顶板导水裂隙带发展模式, 并建立底板“四带”形成与工作面开采过程的对应关系。研究发现: 初采期间底板仅发育矿压破坏带, 达到充分采动后, 新增损伤带及采动导高带开始出现, 新增损伤带主要集中于工作面下方。采动岩体应力-渗流耦合效应归结为: 煤层开采导致顶板破裂和应力的降低, 顶板岩体渗透性能增大, 太灰水透过顶板裂隙渗入采空区和工作面; 底板隔水层在奥灰高承压水的楔劈作用下发育导高裂隙并导升。当残余水头压力无法继续劈裂隔水层岩体抗拉强度, 底板岩层重新恢复到应力-渗流稳定状态。

关键词: 双承压水 顶底板破断 渗流 新增损伤带 采动导高带

Rupture and seepage law of roof floor strata caused by coal mining between double bearing aquifers

Abstract:

Based on coal mining between double bearing aquifers in Shanxi Province, and focused on the stress fluid coupling mechanism of coal and rocks, the study employed physical simulation experiment and discrete element numerical simulation to reveal the rupture regularity of stratum and the seepage with respect to different mining advances. The developing modes of water conductive zones in ruptured roof strata were put forward and the correspondent relationship between the formation of ‘four zones’ in the floor strata and the mining process were established. The study shows that the mining area floor only appears broken zone during primary mining. When a full mining arrives, new damaged zone and mining induced water conductive rising zone begin to develop. The new damaged zone is mainly under the working face. At back of the mining face, the new damaged zone is progressively closed because of the compaction of gob. The stress seepage coupling effect in mining disturbed rock mass can be summarized as follows: the mining leads to rupture of roof and floor strata and a stress drop. The water permeability in rock mass increases, resulting in the aquifer in Taihui strata rush in the goaf and mining face. The water conductive fracture zone develops and water conducting arises in the water proof layer in the floor strata under the water wedge splitting action. When the residual water pressure can not continuously split the water proof layer in the floor strata against the tensile strength of the rock mass, a stress seepage stable state is recovered in the floor strata.

Keywords: double bearing aquifers; rupture of roof and floor strata; seepage; new damaged zone; mining induced water conductive zone

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