

论文

多因素叠加作用下煤储层渗透率的动态变化规律

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摘要:

分析了煤储层渗透率的主要影响因素, 讨论了有关黏性渗流的基本理论问题。在不同轴压、围压和气体压力梯度下, 对山西晋城矿区原状无烟煤煤样进行了三维应力场的CH<sub>4</sub>渗流实验, 计算并分析了有效应力、煤基质收缩、气体滑脱效应等因素对渗透率的影响及其叠加作用的表现。认为吸附态的CH<sub>4</sub>分子组成了煤储层孔-裂隙气体渗流的边界层, 滑脱效应存在于边界层以外, 煤储层渗透率的动态变化是有效应力、煤基质收缩效应和滑脱效应叠加作用的结果, 渗透率在压力梯度0~0.1 MPa阶段衰减最为显著, 滑脱效应对渗透率的贡献远小于基质收缩效应, 且随着压力梯度的增大而几乎可以忽略。

关键词: 煤储层; 渗透率; 叠加作用; 影响因素; 黏性渗流

Dynamic changes laws of the coal reservoirs permeability under the superimposition of multi influential factors

Abstract:

The primary influential factors of coal reservoirs permeability were analyzed, and the basic theoretic problems about viscid seepage of coal reservoirs were discussed. In different conditions of axial compression, confining pressure and pressure gradient of gas, the seepage CH<sub>4</sub> experiments of some anthracite samples, which were picked from Jincheng mining area, Shanxi Province, were carried out in three dimensional stress field. It was calculated and analyzed the factors of effective stress, coal matrix shrinkage and slippage effect of gas affect permeability, and how the actions of superimposition behave. It is considered that the boundary layer consists of molecules of CH<sub>4</sub> in adsorption state when gas permeating in pore fissure of coal reservoirs. The slippage effect occurs out of the boundary layer. The dynamic changes of the coal reservoirs permeability are the superimposition of such influential factors as effective stress, coal matrix shrinkage and slippage effect. The permeability attenuates observably as the pressure gradient from 0 to 0.1 MPa. The magnitude of contribution what slippage effect does for permeability is far less than coal matrix shrinkage effect. The effect of slippage may be ignored when pressure gradient increases.

Keywords: coal reservoirs; permeability; superimposition; influential factor; viscid seepage

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