

## 考虑滑脱效应的煤层气渗流数学模型及数值模拟

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**摘要** 在千米深度下赋存煤层气的煤层处于高地层压力作用, 因此可认为是致密的多孔介质。煤层的渗透率低, 对于致密的多孔介质渗流, 滑脱效应将十分显著。据此, 建立了低渗透率情况下考虑高地层压力作用和滑脱效应的煤层气渗流数学模型, 并采用有限元方法对建立的数学模型进行了数值求解; 比较低渗透率情况下考虑高地层压力作用的滑脱流和原有的达西流对压力分布的影响。建立的煤层气滑脱数学模型为研究煤层气非线性渗流问题奠定基础, 对高地层压力作用下低渗透率储层的煤层气产量估算具有重要的理论价值。

**关键词** [采矿工程](#); [滑脱效应](#); [渗流方程](#); [多孔介质](#); [地层压力](#)

分类号

## MATHEMATICAL MODEL AND NUMERICAL SIMULATION OF COAL-BED METHANE PERCOLATION FLOW EQUATION CONSIDERING SLIPPAGE EFFECTS

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### Abstract

Under the depth of about one kilometer in the deep mining, the pressure of the coal-bed is considerably high and the permeability of the coal-bed is comparatively low, in which the porous media is regarded to be highly compacted. Considering the percolation in this pre-pressing porous media, the slippage effects are remarkable. The model of coal-bed methane percolation equation under high pressure condition, which considers the slippage effects of coal-bed methane, is proposed; and finite element method(FEM) is employed to calculate the numerical value of mathematic model. The pressure gradient calculated by FEM, which is influenced by slippage effects under high pressure condition, is compared with that of mathematic model. The foundation of mathematics model for coal-bed methane slippage is established to study the nonlinear percolation problems of coal-bed methane. The simulated results can provide significant references to the evaluation of the output of the coal-bed methane with low permeability under high pressure condition.

**Key words** [mining engineering](#); [slippage effects](#); [percolation flow equation](#); [porous media](#); [stratum pressure](#)

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