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考虑滑脱效应的非稳态气体渗透性实验研究

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Gas Permeability Experimental Study of Low Permeability Core Considering Effect of Gas Slippage

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摘要/Abstract

摘要：

气体在低渗透多孔介质中渗流时滑脱效应的影响不可忽略，采用稳态法测定低渗透岩心气体渗透率时需在不同压力下多次测量，经线性拟合才可得到岩心的克氏渗透率和滑脱因子。建立了一种新的方法，在已知克氏渗透率与滑脱因子关系式的基础上，通过推导、求解考虑滑脱效应的非稳态气体渗流方程，得到具有一定渗透性的岩心入口端压力衰减曲线，由最小二乘法原理与该衰减曲线拟合，即可得到岩心的克氏渗透率和滑脱因子。实践表明，该方法得到的克氏渗透率、滑脱因子与稳态法实验结果具有较好的一致性，并且具有流程简单、周期短、效率高等优点。

关键词: 滑脱效应, 气体渗流, 低渗透, 非稳态, 气体渗流方程, 最小二乘法

Abstract:

When gas flows in low permeability porous media,the effect of gas slippage cannot be ignored.It takes many times to obtain gas permeability under different pore pressure of low permeability core with conventional method by linear fitting to get intrinsic permeability and slip factor.Based on the relationship between intrinsic permeability and slip factor,a new unsteady gas permeability experiment method was proposed.The principle of the new method is to fit the inlet pressure decay curve tested and calculated that can be obtained by solving unsteady gas flow equation considering slippage effect according to least square curve fitting,then the wanted intrinsic permeability and slip factor can be acquired and verified through conventional experiment.Compared with steady state experiment,this new unsteady method is more correct,and it greatly shortens the time,and simplifies the experiment process.

Key words: Slippage effect, Gas seepage, Low permeability reservoir, Unsteady-state, Gas flow equation, Least squares

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