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论文

渝东南下寒武页岩纳米级孔隙特征及其储气性能

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摘要：

系统采集、观察并描述了渝东南地区下寒武统页岩岩芯，通过有机碳含量、X衍射、甲烷等温吸附及氮气吸附实验测试，分析了页岩纳米级孔隙结构类型、发育特征及影响因素，探讨了纳米孔对页岩储气性能的影响。研究认为，渝东南下寒武统页岩纳米孔隙结构特征复杂，根据氮气吸附-脱附曲线及孔径分布特征可划分为3种类型，主要发育两端开放的管状孔、平行壁的狭缝状孔及四面开放的尖劈形孔等开放型孔隙，多为与有机质相关的纳米孔，孔隙直径一般小于60 nm，呈现2~5，8~12和24~34 nm三个分布峰值区。宏孔（>50 nm）孔隙体积百分含量为8.5%，比表面积百分含量仅占0.3%；中孔（2~50 nm）孔隙体积百分含量高达82.1%，比表面积百分含量为79.0%；微孔（<2 nm）孔隙体积百分含量为9.4%，比表面积百分含量占20.7%。有机碳含量是纳米孔隙结构特征的主控因素，有机质是总孔体积与比表面积发育的物质基础，纳米孔隙体积、比表面积与吸附含气量具有明显的线性关系。

关键词： 渝东南；下寒武统；纳米级孔隙；页岩气

The characteristics of nanoscale pore and its gas storage capability in the Lower Cambrian shale of southeast Chongqing

Abstract:

The Lower Cambrian shale cores in southeast Chongqing were systematically collected，observed and described.Using total organic carbon content，XRD analyses，methane isothermal adsorption and nitrogen adsorption method，the nanoscale pore structure types，characteristics and influenced factors were analyzed and its impact on gas content was discussed.The results show that the nanoscale pore structures in the shale are complex，and are divided into three structure types based on the nitrogen adsorption desorption curves and pore diameter distribution.The nanoscale pores mainly consist of cylinder pores with two open ends，slit type pores with parallel plates，and wedge shape pores with all sides open，which are related to the organic matter.The pore diameters are generally less than 60 nm，and have 2-5，8-12 and 24-34 nm peak distributions.Total volume percentage of macropore (>50 nm) is 8.5%，the BET surface area percentage is 0.3%.Total volume percentage of mesopore (2-50 nm) is 82.1%，the BET surface area percentage is 79.0%.Total volume percentage of micropore (<2 nm) is 9.4%，and the BET surface area percentage is 20.7%.TOC is the main controlling factor of nanoscale pore structure characteristics and the organic matter is the material basis of total pore volume and BET surface area.There is an obvious linear correlation between total pore volume，BET surface area and gas adsorption capacity.

Keywords: southeast Chongqing；the lower Cambrian formation；nanoscale pore；shale gas

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