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Porosity Characteristics of Coal Reservoir in Daqing Exploration Area

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Zhang Yongfeng, Jiang Yongxu, Lu Guoqiang

Exploration and Development Research Institute of Daqing Oilfield Company Ltd., Daqing, China

ABSTRACT: This paper identifies the coal structure in the Daqing exploration area and discusses types of pores in different basins. Coal is a complicated porous medium. Adsorbability and permeability of its pore structure for coalbed methane (CBM) has drawn extensive attention increasingly. Porosity of coal enables the coal reservoir to store gas and allows CBM to desorb, diffuse and percolate. For this reason, it is of significance to study the pore structure characteristics for exploration and development of CBM as well as evaluation of its mineability. In the three basins of the Daqing exploration area, the coal basins include Hailar basin in the west and Jixi and Hegang basins in the Sanjiang region in the east as representatives. The coal from the Huhehu depression belongs to lignite. A great deal of intact plant tissue pores can be observed in the SEM. The cell cavities deform to different extents because of compaction effect, but they arrange in a uniform direction with similar shapes, which indicates a feature of plant tissues. The fine stratification and fissures can be seen in locality. Its fractures occur in interlamination, but the fractures connecting the pores are rare, which contribute less to the permeability of coal. So, this is the disadvantage of migration and deposit of CBM. The Huhehu depression is the one where the original texture of coal mainly develops. The coal in Jixi and Hegang basins develops better between gas coal and coking coal. Though parts of plant tissue pores remain in the coal, the pores are filled nearly with minerals. A great many blowholes and emporia exist in the coal with lithification. Some microstructures such as friction surfaces occur with anabatic deformation. The original texture is destroyed in the tectonic coal so that the pore structure becomes complicated. A large number of micro-fractures and shrinkage joints form connected bridges between pores, which improves seepage capability among coal pores to some extent. There are three types of low temperature nitrogen adsorption curves in the Daqing exploration area, which represent different types of pore structure. There is type I in the Huhehu depression. Type I indicates that the coal reservoir has a great many open breathing holes and a few of non-air holes whose one end is closed. The pore size is distributed in twin peaks. Type II and type III can be found in Jixi and Hegang basins. Type II indicates their pores are in composite with multi-pore form and contain ink bottle pores and non-breathing pores whose one end is closed. Type III adsorption and desorption curves have a distinct hysteresis loop. The pore volume exists in two peaks, but pores at a size of 3–4 nm have the greatest specific surface area. The micro-pore becomes the greatest contributor to specific surface area. Occurrence of a large number of ink bottle micro-pores is a major reason for the difference of adsorption capacity.

KEYWORD: Daqing exploration area; Pores characteristics; Low temperature nitrogen adsorption method; Pore structure

References

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Primary authors: Mr ZHANG, yongfeng; Mr JIANG, yongxu; Mr LU, guoqiang

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