Safety Science
Volume 50, Issue 4, April 2012, Pages 899 – 902
First International Symposium on Mine Safety Science and Engineering 2011

Special Issue Article: The First International Symposium on Mine Safety Science and Engineering

Experimental research on displacing coal bed methane with supercritical CO_2 ☆

Tao Yang[a, b], Baisheng Nie[a, b], Dong Yang[c], Ruming Zhang[a, b], Caihong Zhao[a, b]

[a] Faculty of Resources and Safety Engineering, China University of Mining & Technology, Beijing 100083, China
[b] State Key Laboratory of Coal Resources and Safe Mining, Beijing 100083, China
[c] College of Mining Technology, Taiyuan University of Technology, Taiyuan 030024, China

http://dx.doi.org/10.1016/j.ssci.2011.08.011, How to Cite or Link Using DOI

Abstract

The high-gas and low-permeability are the common problems of China coal mine, which restrain the mining of coal-seam gas resources safely and efficiently. Hence, to solve the problem of low permeability of coal seam, an experimental system was set up and experimental research was conducted to investigate the effect of the displacement of methane by injecting supercritical CO_2 into coal samples. The experimental results indicated that, the extraction effect of supercritical CO_2 changes the coal's porosity, and broadens the seepage channel for methane. Thus, the methane could be desorbed effectively from the coal matrix, and flow through more cracks at higher speed.

Highlights

► To improve the permeability of coal-bed, an experimental system was set up. ► The effect of displacement of coal-bed methane by supercritical CO_2 was studied. ► The extraction broadens the seepage channel for coal-bed methane. ► The permeability of coal sample increased after the extraction of supercritical CO_2.

Keywords

Supercritical CO_2; Displacement; Methane; Experimental research

Figures and tables from this article:

Fig. 1. Coal sample used in displacement experiment.

Figure options

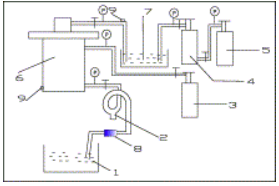

Fig. 2. The schematic diagram of SC-CO_2 displacement experiment system. 1 – Gas gathering device; 2 – product separation device; 3 – confining pressure cylinders; 4 – high pressure CO_2 cylinders; 5 – CO_2 fill cylinders; 6 – displacement experiment reaction axe; 7 – CO_2 preheating and heat preservation device; 8 – gas accumulated flowmeter;9 – temperature sensor.

Figure options

Fig. 3. The experiment system of SC-CO_2 displacing coalbed methane.

Figure options

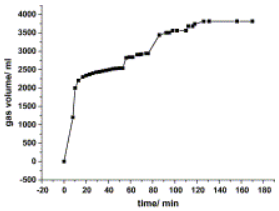

Fig. 4. The relationship of gas output variation with time.

Figure options

Fig. 5. The coal sample used in displacement experiment.

Figure options

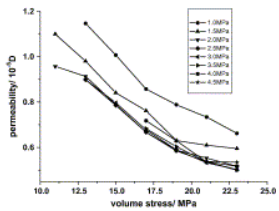

Fig. 6. The relationship between the permeability and the volume stress of Zichang coal sample before the supercritical experiment.

Figure options

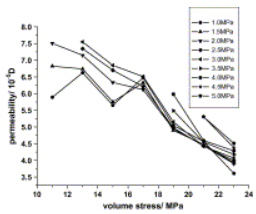

Fig. 7. The relationship between the permeability and the volume stress of Zichang coal sample after the supercritical

experiment.

Figure options

Table 1. The industrial analysis data of coal from Zichang.

View Within Article

☆

The First International Symposium on Mine Safety Science and Engineering (ISMSSE2011) will be held in Beijing on October 26 – 29, 2011. The symposium is authorized by the State Administration of Work Safety and is sponsored by China Academy of Safety Science & Technology (CASST), China University of Mining & Technology (Beijing) (CUMTB), Datong Coal Mine Group, McGill University (Canada) and University of Wollongong (Australia) with participation from several other universities from round the world, research institutes, professional associations and large enterprises. The topics will focus on mines safety field: theory on mine safety science and engineering technology, coal mine safety science & engineering technology, metal and nonmetal mines safety science & engineering technology, petroleum and natural gas exploitation safety science & engineering technology, mine safety management and safety standardization science & technology, occupational health and safety in mine, emergent rescue engineering technology in mine, etc.

Corresponding author at: Faculty of Resources and Safety Engineering, China University of Mining & Technology, Beijing 100083, China. Tel.: +86 18911552313; fax: +86 010 82375620.