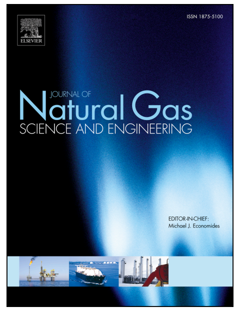
Accepted Manuscript



Multi-scale fractal characterizations of lignite, subbituminous and high-volatile bituminous coals pores by mercury intrusion porosimetry

Sandong Zhou, Dameng Liu, Yidong Cai, Yanbin Yao, Yao Che, Zhihua Liu

PII: S1875-5100(17)30192-0

DOI: 10.1016/j.jngse.2017.04.021

Reference: JNGSE 2160

To appear in: *Journal of Natural Gas Science and Engineering*

Received Date: 20 June 2016

Revised Date: 19 April 2017

Accepted Date: 23 April 2017

Multi-scale fractal characterizations of lignite, subbituminous and high-volatile bituminous coals pores by mercury intrusion porosimetry

Sandong Zhou, Dameng Liu*, Yidong Cai, Yanbin Yao, Yao Che, Zhihua Liu

Coal Reservoir Laboratory of National Engineering Research Center of CBM Development & Utilization, School of Energy Resources, China University of Geosciences, Beijing 100083, China

Abstract: Pore fractal models, including thermodynamics and classic geometry models, can help quantify pore structure. To evaluate the effect of the pore structure on coal permeability, we calculated the multi-scale fractal dimensions and discussed factors influencing pore fractals, including coal petrology and coal reservoir parameters. We investigated pore physical properties, including of the pore size/volume distribution, pore structure and pore heterogeneity for lignite, subbituminous and high-volatile bituminous coals (LSBC) in the Southern Junggar Basin, NW China. The multi-scale fractal dimensions of coal pores according to classic geometry models (D_{c1}, D_{c2}, D_{c3} and D_{c4}) are in the range of 3.15 to 4.26, 2.42 to 3.92, 2.30 to 3.60 and 2.35 to 5.41, respectively. The abnormal fractal dimensions (D >3) can be attributed to high pore heterogeneity, fractures that existed in coals and pore compressibility during a high-pressure mercury injection. The fractal dimension (D_c) and $R_{o,\,m}$ generally presented an inverted 'U-shaped' tendency with maxima occurring at 0.6% $R_{o,\,m}$, which was mainly caused by variations in the macropore volume by the first coalification jump. It was found that the multi-scale fractal dimensions of classic geometry model is more appropriate for describing pore heterogeneity in LSBC. The micropore/macropore volumes and the fractal dimension (D_{c3} and D_{c4}) were predominant indices of pores connectivity (IMS and EMW). A 'U-shaped' trend was obtained between the permeability

* Corresponding author: Tel: +86-10-82323971 (O); fax: + 86-10-82326850. *E-mail address*: dmliu@cugb.edu.cn