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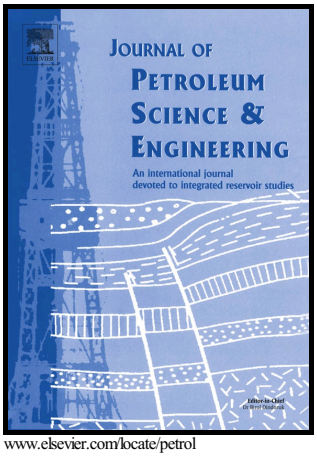

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PII: S0920-4105(16)30217-0
DOI: http://dx.doi.org/10.1016/j.petrol.2016.05.047
Reference: PETROL3490

To appear in: *Journal of Petroleum Science and Engineering*

Received date: 6 March 2016
Revised date: 6 May 2016
Accepted date: 31 May 2016

Cite this article as: Pengcheng Liu, Zhe Yuan and Kewen Li, An improvec capillary pressure model using fractal geometry for coal rock, *Journal o Petroleum Science and Engineering* http://dx.doi.org/10.1016/j.petrol.2016.05.047

An improved capillary pressure model using fractal geometry for coal rock

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Abstract

Based on fractal geometry and the "matchstick" tubes model, an improved capillary pressure model was theoretically derived to assess capillary pressure data for coal. The model was based on fractal geometry and the "matchstick" tubes model. Our improved model can be simplified as Li model and Brooks-Corey (B-C) model when the fractal dimension and tortuosity parameter take specific values in coal porous media. Furthermore, the capillary pressure data of different coals samples collected in the LZ Coal Mine in China were measured employing mercury intrusion method, and the heterogeneity of typical coal samples were evaluated using the pore volumetric percent curves and SEM images. The matching results of the B-C model, Van Genuchten (V-G) model, Li model, and our improved model were assessed in comparison with the test data. The comparison indicated that our improved model had better agreement with the test data relative to the conventional models.

***Keywords*:** Coalbed methane; Coal; Capillary pressure; Fractal; Tortuosity

Nomenclature

ϕ	porosity
a	a unit's length of the fractal object
V_p	pore volume
λ	pore size distribution index
θ	contact angle
S_w	wetting phase saturation
S_{wd}	normalized wetting phase saturation