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A multi-site model to determine supercritical methane adsorption in energetically heterogeneous shales

Jing Li ^{a,b}, Zhangxin Chen ^{a,b*}, Kelu Wu ^{a,b*}, Kun Wang ^a, Jia Luo ^a, Dong Feng ^b,

Shiyuan Qu ^b, Xiangfang Li ^b

^a Chemical and Petroleum Engineering, University of Calgary, Calgary, Alberta T2N1N4, Canada

^b Key Laboratory for Petroleum Engineering of the Ministry of Education, China University of Petroleum (Beijing), Beijing 102249, P.R. China.

* Corresponding author:

Zhangxin Chen, zhachen@ucalgary.ca; Kelu Wu, wukeliu19850109@163.com.

Highlights

- (1) Supercritical methane adsorption in gas shales was experimentally investigated;
- (2) Relationship between the adsorption heat and the surface coverage was characterized;
- (3) The effect of surface heterogeneity on the gas adsorption behavior was demonstrated.

Abstract

A multi-site adsorption model was employed to determine the supercritical methane adsorption in shales, in which the heterogeneity of surface energy distribution was considered. Additionally, the high-pressure (~20 MPa) methane adsorption behaviors at different temperature conditions (303 K, 333 K and 363 K) were experimentally investigated, and both the traditional single-site model and the multi-site model were employed to analyze the experimental data. Results show that (i) although these two models can achieve acceptable fitting results with the measured adsorption amounts, the adsorption heat interpreted by them shows significant discrepancy. The adsorption heat calculated by the single-site model is always a constant, while it obtained by the multi-site model decreases with

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