Supplementary file

Gas transport mechanisms, mathematical models, and impact factors in low-permeability rocks: A critical review

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Table S1. Mathematical models for gas transportation in nano-porous media.

References	Description	Limitation
(Klinkenberg, 1941)	Empirical model with slippage effect.	With no consideration of other flow mechanisms.
(Baehr, 1990)	Extension of Fick's law for a multicomponent mixture	Inappropriate for porous media.
(Pruess, 1991)	Linear addition of advection and diffusion fluxes.	Ignore coupling between advective and diffusive mechanisms.
(Webb and Pruess, 2003)	Combination of diffusion (ordinary and Knudsen) and advection	Underpredict cumulative flow under low permeability.
(Wu and Persoff, 1998)	Analytical solutions considering slippage effects.	Ideal gas flow model at low pressure condition.
(Beskok and Karniadakis, 1999)	Empirical model considering all bulk gas flow mechanisms.	Excessive empirical coefficient.
(Civan, 2010)	Considering various influence factors based on the Beskok and Karniadakis's model.	Excessive empirical coefficient.
(Xiong et al., 2012)	Considering adsorbed gas and surface diffusion based on the Beskok and Karniadakis's model.	Excessive empirical coefficient.
(Wang et al., 2017)	Considering monolayer and multilayer, and surface diffusion based on the Beskok and Karniadakis's model.	Excessive empirical coefficient.
(Anderson et al., 2014)	Continuous flow model modified by slip boundary condition.	Slip factor is determined by the experiments.
(Ertekin et al., 1986)	Considering Darcy flow and molecular Fickian diffusion.	Constant weight factors. For pores with circular cross-section.
(Liu et al., 2002)	Considering the continuum flow and Knudsen diffusion.	With no consideration of the real gas effect. For pores with circular cross-section.
(Javadpour, 2009)	Linearly superposing the continuum flow and Knudsen diffusion.	With no consideration of the real gas effect. For pores with circular cross-section.
(Azom and Javadpour, 2012)	Extending Javadpour's model by considering the real gas effect.	For pores with circular cross-section.
(Darabi et al., 2012)	Extending Javadpour's model by considering the effect of pore wall roughness.	For pores with circular cross-section.

(Ma et al., 2014)	Extending Javadpour's model by considering the real gas effect.	Liner superposition.
(Sakhaee-Pour and Bryant, 2012)	Considering free molecular diffusion and slip flow.	For pores with circular cross-section.
(Singh and Javadpour, 2013)	Considering advection and diffusion flow.	For low Knudsen number condition.
(Rahmanian et al., 2013)	Considering viscous flow and gas diffusion.	For pores with slit cross-section.
(Singh et al., 2013)	A non-empirical model considering viscous flow and Knudsen diffusion	With no consideration of the real gas effect.
(Wu et al., 2015)	Considering slip flow and Knudsen diffusion.	With no consideration of the adsorbed gas transportation mechanisms.
(Sun et al., 2018)	A non-empirical model for viscous flow considering various influence factors.	With no consideration of the adsorbed gas transportation mechanisms.
(Wu et al., 2016)	Considering slip flow, Knudsen diffusion and surface diffusion.	For pores with circular cross-section. With no consideration of the real gas effect.
(Li et al., 2017)	Considering the continuum flow, surface diffusion and desorption.	For pores with circular and slip cross-section separately.
(Zhang et al., 2018)	Considering viscous flow, Knudsen diffusion and surface diffusion.	For pores with circular cross-section.
(Huang et al., 2018)	Considering viscous flow, slip flow, Knudsen diffusion and surface diffusion.	For pores with circular cross-section.
(Shen et al., 2018)	Considering slip flow, Knudsen diffusion, surface diffusion and adsorption.	For pores with slit cross-section.

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