The Influence of Wettability on the Permeability and Capillary Pressure in the Hydrate-Bearing Porous Media

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Natural gas hydrates are viewed as premium fuel for this century, for the cleanly burning and low pollution. Because of permeability is a property of the porous medium and describes the transmissibility with which fluid can pass through the pore structure, permeability is a key parameter for estimating gas production performance and the flow behaviors of the gas and water during dissociation. To study the index properties and seepage properties of the hydrate-bearing porous media, pore network models combined X-ray computed tomography (CT) are proposed to investigate the influence of wettability on permeability and capillary pressure in the hydrate-bearing porous media. Contact angle is the most reliable method for wettability estimation. The results show that porosities calculated using a two-phase flow simulator in the pore network models are in agreement with those calculated using the volumetric method. The properties of pore networks, such as the average pore radii and the average throat radii, are calculated as well. Moreover, at the same water saturation, the increasing advancing contact angle decreases the capillary pressure of the hydrate-bearing porous media. In addition, at the same water saturation, the increasing advancing contact angle increases the water relative permeability and decreases the gas relative permeability.