

2nd International Conference and Expo on

OIL AND GAS

October 27-28, 2016 Rome, Italy

Relative permeability prediction considering complex pore geometry and wetting characteristics in carbonate reservoirs

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The measurement of k_r (relative permeability) in carbonate rock is difficult and has great uncertainties due to the complex pore system such as dissolved pore, cavity and fractures. Several equations for the calculation of k_r are developed, but they assume single pore system that it cannot be applied directly to the complex pore system. Furthermore, the wetting characteristics have to be considered because most carbonate rocks tend to oil-wet. This study presents the method of k_r estimation with respect to the heterogeneous pore network. Firstly, the wetting characteristics are determined by the measurement of contact angle. For each core, pore size distribution, P_c (capillary pressure) and residual oil saturation are measured. From the estimated contact angle, all the samples are determined as an oil-wet. It is observed that P_c has different curve according to the macro and micro-pore, respectively. Then, k_r is generated from P_c by using Brook-Corey equation for each pore size. As a result, for the macro-pore, the water has higher k_r than oil that it can be displaced easily by only the small reduction of oil saturation. In contrast, the micro-pore has general shape of k_r curve. Consequently, it is found that oil flows differently through macro and micro-pore according to the oil saturation.

Biography

Sun-lee Han received her BS from Chonbuk National University. She is MS student in Petroleum Engineering Lab. of Chonbuk National University. She is studying about fluid flow in complex pore network, CO_2 EOR and reservoir simulation.

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