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Number of moles fractal dimensions for characterizing Shajara reservoirs of the Shajara formation, Saudi Arabia

Khalid Elyas Mohamed Elameen AlKhidir
King Saud University, KSA

The quality and assessment of a reservoir can be documented in details by the application of number of moles. This research aims to calculate fractal dimension from the relationship among number of moles, maximum number of moles and wetting phase saturation and to confirm it by the fractal dimension derived from the relationship among capillary pressure and wetting phase saturation. In this research, porosity was measured on real collected sand stone samples and permeability was calculated theoretically from capillary pressure profile measured by mercury intrusion contaminating the pores of sand stone samples in consideration. Two equations for calculating the fractal dimensions have been employed. The first one describes the functional relationship between wetting phase saturation, number of moles, maximum number of moles and fractal dimension. The second equation implies to the wetting phase saturation as a function of capillary pressure and the fractal dimension. Two procedures for obtaining the fractal dimensions have been utilized. The first procedure was done by plotting the logarithm of the ratio between number of mole and maximum number of moles versus logarithm wetting phase saturation. The slope of the first procedure =3-Do (fractal dimension). The second procedure for obtaining the fractal dimension was concluded by plotting the logarithm of capillary pressure versus the logarithm of wetting phase saturation. The slope of the second procedure = Df-3. On the basis of the obtained results of the fabricated stratigraphic column and the attained values of the fractal dimension, the sand stones of the Shajara reservoirs of the Shajara formation were divided here into three units. The gained units from bottom to top are lower Shajara number of moles fractal dimension unit, middle Shajara number of moles fractal dimension unit and upper Shajara number of moles fractal dimension unit. The results show similarity between number of moles fractal dimension and capillary pressure fractal dimension. It was also noted that samples with wide range of pore radius were characterized by high values of fractal dimensions due to an increase in their connectivity which permit accommodation of high number of moles. In our case as conclusions, the higher the fractal dimension, the higher the heterogeneity, the higher the permeability, the better the reservoir characteristics.

kalkhidir@ksu.edu.sa
alkhidir@yahoo.com