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Seismo electric bio availability fractal dimension for characterizing Shajara reservoirs of the Permo – Carboniferous Shajara Formation, Saudi Arabia

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The quality and assessment of a reservoir can be documented in details by the application of seismo electric bio availability. This research aims to calculate fractal dimension from the relationship among seismo electric bio availability, maximum seismo electric bio availability and wetting phase saturation and to approve 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 sandstone samples and permeability was calculated theoretically from capillary pressure profile measured by mercury intrusion contaminating the pores of sandstone samples in consideration. Two equations for calculating the fractal dimensions have been employed. The first one describes the functional relationship between wetting phase saturation, seismo electric bio availability, maximum seismo electric bio availability 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 dimension have been utilized. The first procedure was done by plotting the logarithm of the ratio between seismo electric bio availability and maximum seismo electric bio availability versus logarithm wetting phase saturation. The slope of the first procedure = $3 - D_f$ (fractal dimension). The second procedure for obtaining the fractal dimension was determined by plotting the logarithm of capillary pressure versus the logarithm of wetting phase saturation. The slope of the second procedure = $D_f - 3$. On the basis of the obtained results of the fabricated stratigraphic column and the attained values of the fractal dimension, the sandstones of the Shajara reservoirs of the Shajara Formation were divided here into three units. The obtained units from bottom to top are: Lower, Middle and Upper Shajara seismo electric bio availability Fractal Dimension Units. It was found that fractal dimension increases with increasing grain size and permeability.

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