



# 2nd International Oil and Gas Conference

December 3-5, 2018 Dubai, UAE

## Seismo Mechanical Energy Fractal Dimension for Characterizing Shajara Reservoirs of the Permo-Carboniferous Shajara Formation, Saudi Arabia

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The quality of a reservoir can be described in details by the application of seismo mechanical energy fractal dimension. The objective of this research is to calculate fractal dimension from the relationship among seismo mechanical energy, maximum seismo mechanical energy 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 sandstone samples and permeability was calculated theoretically from capillary pressure profile measured by mercury intrusion techniques. Two equations for calculating the fractal dimensions have been employed. The first one describes the functional relationship between wetting phase saturation, seismo mechanical energy, maximum seismo mechanical energy 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 developed. The first procedure was done by plotting the logarithm of the ratio between seismo mechanical energy and maximum seismo mechanical energy 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 completed 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 constructed stratigraphic column and the acquired values of the fractal dimension, the sandstones of the Shajara reservoirs of the Shajara Formation were divided here into three units. The gained units from bottom to top are: Lower Shajara Seismo Mechanical Energy Fractal Dimension Unit, Middle Shajara Seismo Mechanical Energy Fractal Dimension Unit, and Upper Shajara Seismo Mechanical Energy Fractal Dimension Unit. The fractal dimension was found to increase with increasing permeability and grain size.

### Biography:

Khalid Elyas Mohamed Elameen Alkhidir is Professor at King Saud University. He did his postdoctoral research at King Saud University, College of Engineering, Department of Petroleum and Natural Gas Engineering, Al-Anoud Research Chair in Petroleum, enhanced oil recovery. He published papers in sandstone reservoirs characterization, tight carbonate reservoirs characterization, and in an enhanced oil recovery.