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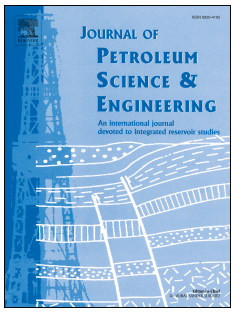

Theoretical and experimental determination of the fractal dimension and pore size distribution index of a porous sample using spontaneous imbibition dynamics theory

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THEORETICAL AND EXPERIMENTAL DETERMINATION OF THE FRACTAL DIMENSION AND PORE SIZE DISTRIBUTION INDEX OF A POROUS SAMPLE USING SPONTANEOUS IMBIBITION DYNAMICS THEORY

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ABSTRACT

The fractal dimension of a porous sample is a microstructural parameter that has a strong bearing on physical, biological and physicochemical processes in addition to determining the degree of heterogeneity or homogeneity of sediments. In the petroleum and allied industries, several methods including the mercury intrusion method have been used for the determination of the fractal dimension of porous samples.

In this study, we have used a spontaneous imbibition dynamics model that integrates the fractal dimension parameter in addition to other microstructural parameters and fluid properties for experimental purposes. Using mathematical approach, this model has permitted us to use experimental data on spontaneous imbibition rise versus time to determine for the first time, the fractal dimension and pore size distribution index of Wallace Sandstone from Nova Scotia after petrophysical and fractal characterizations of core samples. Wallace sandstone is an outcrop and values of fractal dimensions deduced using samples of this sandstone agree with those deduced using *in situ* methods in open cast mines reported in the literature. What is more, the mean value