Abstract

Estimation of the Permeability of a Porous Medium Using the Geometric Structural Function

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Permeability or hydraulic conductivity of porous geological media are the most important properties of reservoir engineering and the most difficult to measure on a reservoir scale. Although many works are devoted to the problem of relating electric and hydraulic conductivity based on Kozeni-Carman relations, network models, or experimental data fitting, definite progress has been sporadic. A link between electrical and flow properties of a porous medium has been developed recently based on a structural function which is associated with the spectral measure in analytic representation of the effective complex permittivity of a two-component composite medium. We demonstrate the use of this relationship in interpreting the electric response of a geologic formation due to applied sources in a borehole to characterize the microstructural geometry of the medium outside the well. This microstructural information is recovered in a form which allows us to use it for characterizing other transport and physical properties of the rocks. This approach might provide an alternative indirect method of measuring permeability in a geological setting.unfl

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