

FRACTAL DIMENSION OF VISCOUS FINGERING PATTERN FROM TWO VISCOUS OILS

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ABSTRACT

We study the evolution of fingering pattern with two different high viscosity gear oils in planar Hele Shaw cell. Fingering being instantaneous process, it is recorded using digital camera and movie frames at selected time of one second were extracted. The images so obtained were further processed for extraction of the border to be used for determination of fractal dimension using Richardson's plot technique. For implementation of the box counting technique the complete image of the fingering pattern was used. Richardson's plot technique is effective in finding out the complexity of structure and texture associated with ramified boundaries where as box counting technique provides information on complexity of gross shape and structure. It is interesting to note that the shapes of fingering patterns have different degree of complexity of structure and texture at different length scales. This is clearly revealed by Richardson's plot technique where the fractal dimensions at lower and higher length scale (λ) are appreciably different. Details are presented and results discussed.

KEYWORDS: Fractal, Hele Shaw Cell, Viscous Fingering, Box Counting, Richardson Plot