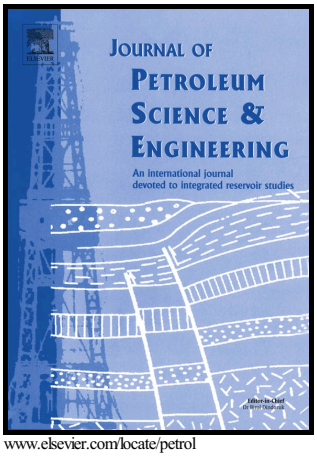

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Experimental Determination of Relative Permeability for Two Phase Flow (Oil-Water) in Fractured Porous Media – Up-scaling Relative Permeability

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Abstract

In this paper, results of an innovative drainage visualization experiments for two-phase flow in fractured porous media are presented. The visualization helps us better understand the flow interaction between matrix and fracture and how the flow discontinuity affects relative permeability. The laboratory model is then used to validate the numerical procedure for simulating two phase flow in fractured porous media.

A glass bead model with single and multiple fractures (with variable orientation) is adapted to mimic the porous medium. Multiple phases (oil and water) are injected under unsteady state condition and differential pressure and produced volumes of the two phases are recorded. The displacements are modelled using a commercial black oil simulator. Local grid refinement is used to simulate flow in grid elements intersected by fractures. The estimated pressure and volumes of the two phases are matched with the laboratory observations using history matching to obtain relative permeability curves. Experimental results containing pressure and production profiles as well as relative permeability curves at two different constant flow rates are presented and discussed. A mathematical correlation based on number of fractures, fracture orientation and fracture intersected angle is obtained for estimating relative permeability for fractured porous media. The laboratory derived