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Estimation of Relative Permeabilities and Capillary Pressures in Shale Using Simulation Method

Authors : F. C. Amadi, G. C. Enyi, G. Nasr

Abstract : Relative permeabilities are practical factors that are used to correct the single phase Darcy’s law for application to multiphase flow. For effective characterisation of large-scale multiphase flow in hydrocarbon recovery, relative permeability and capillary pressures are used. These parameters are acquired via special core flooding experiments. Special core analysis (SCAL) module of reservoir simulation is applied by engineers for the evaluation of these parameters. But, core flooding experiments in shale core sample are expensive and time consuming before various flow assumptions are achieved for instance Darcy’s law. This makes it imperative for the application of coreflooding simulations in which various analysis of relative permeabilities and capillary pressures of multiphase flow can be carried out efficiently and effectively at a relative pace. This paper presents a Sendra software simulation of core flooding to achieve to relative permeabilities and capillary pressures using different correlations. The approach used in this study was three steps. The first step, the basic petrophysical parameters of Marcellus shale sample such as porosity was determined using laboratory techniques. Secondly, core flooding was simulated for particular scenario of injection using different correlations. And thirdly the best fit correlations for the estimation of relative permeability and capillary pressure was obtained. This research approach saves cost and time and very reliable in the computation of relative permeability and capillary pressures at steady or unsteady state, drainage or imbibition processes in oil and gas industry when compared to other methods.

Keywords : relative permeabilty, porosity, 1-D black oil simulator, capillary pressures
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