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Simulating single-phase and two-phase non-Newtonian fluid flow of a digital rock scanned at high resolution MOUSSA TEMBELY, ALI M. ALSUMAITI, MOHAMED S. JOUINI, KHURSHED RAHIMOV, The Petroleum Institute, part of Khalifa University of Science and Technology, Abu Dhabi, UAE, ALI DOLATABADI, Concordia University, Montreal, Canada — Most of the digital rock physics (DRP) simulations focus on Newtonian fluids and overlook the detailed description of rock-fluid interaction. A better understanding of multiphase non-Newtonian fluid flow at pore-scale is crucial for optimizing enhanced oil recovery (EOR). The Darcy scale properties of reservoir rocks such as the capillary pressure curves and the relative permeability are controlled by the pore-scale behavior of the multiphase flow. In the present work, a volume of fluid (VOF) method coupled with an adaptive meshing technique is used to perform the pore-scale simulation on a 3D X-ray micro-tomography (CT) images of rock samples. The numerical model is based on the resolution of the Navier-Stokes equations along with a phase fraction equation incorporating the dynamics contact model. The simulations of a single phase flow for the absolute permeability showed a good agreement with the literature benchmark. Subsequently, the code is used to simulate a two-phase flow consisting of a polymer solution, displaying a shear-thinning power law viscosity. The simulations enable to access the impact of the consistency factor (K), the behavior index (n), along with the two contact angles (advancing and receding) on the relative permeability.

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