Simulation of Polymeric Nanofluid Flooding in an Iranian Oil Reservoir

Kamran Ahmadi [1], Payam Mohammadalinejad [2]* , Mehdi Mohammadi Toiserkani[3]

[1] Institute of Petroleum Engineering, College of Chemical Engineering, University of Tehran, Tehran, Iran

Email: kamran.ahmadi2011@gmail.com

[2] Institute of Petroleum Engineering, College of Chemical Engineering, University of Tehran, Tehran, Iran

Email: payammohammadalinejad@gmail.com

[3] Institute of Petroleum Engineering, College of Chemical Engineering, University of Tehran, Tehran, Iran

Email: Mehdi.mohammadi2012@gmail.com

Abstract

Nowadays, application of nanotechnology in the oil industry has become a useful approach in oil production. In order to boost the oil production of existing reservoirs, it is necessary to use various enhanced oil recovery (EOR) methods. One of them is polymer flooding. The purpose of adding polymers in water is to increase the apparent viscosity of water which helps lower the mobility ratio and this condition maximizes the sweep efficiency of oil recovery. Nanotechnology can improve the rheological properties of polymeric fluids, so we can achieve more oil recovery efficiency by using polymeric nanofluid flooding.

In this paper, efficiency of polymeric nanofluid flooding for enhanced oil recovery in an Iranian oil field is analyzed by Eclipse100 simulation model of the reservoir and the result is compared to the efficiency of other EOR scenarios such as water injection, gas injection and polymer flooding. Results of this work indicated that polymeric nanofluid (guar + 20nm SiO_2) flooding in five-spot pattern has the highest oil production and lowest residual oil saturation. The oil recovery increased about 4.2% after water injection process.

1. Introduction

Nanotechnology has contributed to the technological advances in various industries such as medicine, electronics, biomaterials and renewable energy production over the last decade. Recently, renewed interests have been arised in the application of nanotechnology for the upstream petroleum industry such as exploration, production and distribution. In particular, adding nanoparticles (NPs) to fluids may drastically benefit enhanced oil recovery (EOR) such as changing the properties of the fluid,