Abstract

Until now Alkaline-Surfactant-Polymer (ASP) studies have been carried out using chemical surfactants and polymers. This experimental investigation was performed to evaluate the possibility of using a biosurfactant and a biopolymer with sodium carbonate as a basis for ASP flooding for an Omani oil field. The reservoir was characterized as a potential candidate for ASP flooding having favorable properties such as high permeability (500-1000 mD), low oil viscosity (20-25 cp), favorable total acid number (0.1 mg KOH/g Oil) and high residual saturation (>20%).

The study was done to design an optimum composition of Alkali/Biosurfactant/Biopolymer (AbSbP) slug and apply it for enhancing oil recovery in both reservoir cores and Berea cores. The interfacial tension between various solutions containing alkali, biosurfactant and biopolymer was measured. Interfacial tension values in the range of 0.02-0.1mN/m were achieved at low biosurfactant and alkali concentrations. The interaction of the biopolymer with the brine, biosurfactant and alkali was investigated in terms of their effect on its viscosity at reservoir temperature of 50 °C. An AbSbP slug containing 1.1 wt.% sodium carbonate, 20 v/v% biosurfactant broth and 20 v/v% biopolymer broth has been recommended for the final core flooding experiment.

Core flooding experiments were conducted using reservoir cores and Berea cores by injecting the formulated AbS and AbSbP slugs after brine flooding. Maximum additional oil recovery obtained was 14% and 32% of oil initially in place (OIIP) from the reservoir cores and Berea cores respectively. Such difference in additional recovery was mainly due to the vast difference in the mineralogical composition of the two rock types.