

Comparative Studies on Spontaneous Imbibition of Surfactant/Alkaline Solution in Carbonate Rocks

Authors : M. Asgari, N. Heydari, N. Shojai Kaveh, S. N. Ashrafizadeh

Abstract : Chemical flooding methods are having importance in enhanced oil recovery to recover the trapped oil after conventional recovery, as conventional oil resources become scarce. The surfactant/alkaline process consists of injecting alkali and synthetic surfactant. The addition of surfactant to injected water reduces oil/water IFT and/or alters wettability. The alkali generates soap in situ by reaction between the alkali and naphthenic acids in the crude oil. Oil recovery in fractured reservoirs mostly depends on spontaneous imbibition (SI) of brine into matrix blocks. Thus far, few efforts have been made toward understanding the relative influence of capillary and gravity forces on the fluid flow. This paper studies the controlling mechanisms of spontaneous imbibition process in chalk formations by consideration of type and concentration of surfactants, CMC, pH and alkaline reagent concentration. Wetting properties of carbonate rock have been investigated by means of contact-angle measurements. Interfacial-tension measurements were conducted using spinning drop method. Ten imbibition experiments were conducted in atmospheric pressure and various temperatures from 30°C to 50°C. All experiments were conducted above the CMC of each surfactant. The experimental results were evaluated in terms of ultimate oil recovery and reveal that wettability alteration achieved by nonionic surfactant, which led to imbibition of brine sample containing the nonionic surfactant, while IFT value was not in range of ultra low. The displacement of oil was initially dominated by capillary forces. However, for cationic surfactant, gravity forces was the dominant force for oil production by surfactant solution to overcome the negative capillary pressure.

Keywords : alkaline, capillary, gravity, imbibition, surfactant, wettability

Conference Title : ICPET 2018 : International Conference on Petroleum Engineering and Technology

Conference Location : Paris, France

Conference Dates : August 27-28, 2018