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Coconut Husk Based Lignosulfonate as Sacrificial Agent in Surfactant Flooding

Abstract

Surfactant flooding is one of the techniques in chemical enhanced oil recovery (CEOR). The purpose of this technique is to reduce the interfacial tension between brine and oil in the reservoir so that the oil can be mobilized to the production well. However, the surfactant tends to adsorb on the rock minerals making it less efficient. The adsorption can be minimized by using three methods: matching surfactant type to specific reservoir rock by surface charge, application of surfactant mixtures to enhance the surfactant capability and using a sacrificial adsorbate to block the adsorption site on the rocks. This study will focus on utilizing the lignosulfonate (LS) from coconut husk as a sacrificial agent to increase the efficiency of surfactant flooding. Lignin was extracted from coconut husk before sulfonated using sodium sulphite, Na2SO3 to form lignosulfonate. FTIR was used to characterize the lignin and lignosulfonate and compare them with the commercial product. The oil (paraffin) displacement experiment was then conducted using 5% illite and 95% sand to simulate Malaysia's sandstone reservoir mineral composition. Two types of surfactant were studied; anionic (Sodium Dodeclyl Sulfate-SDS) and nonionic (4-octylphenol polyethoxylate-TX100). The percentage of oil recovery was calculated based on the volume of oil recovered from the original oil in place (OOIP). The displacement tests show that oil recovery was increased from 2.52% to 3.10% for SDS after the preflush and from 1.36% to 2.00% for TX100 after preflush with LS. This increase corresponds to 23.6% and 47.1% increments in oil cerovery from the test without preflush, respectively. These results have shown that the LS has the potential to be used as a sacrificial agent to increase the efficiency of surfactant flooding.