World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Performance of CO_2/N_2 Foam in Enhanced Oil Recovery

Authors : Mohamed Hassan, Rahul Gajbhiye

Abstract : The high mobility and gravity override of CO_2 gas can be minimized by generating the CO_2 foam with the aid of surfactant. However, CO_2 is unable to generate the foam/stable foam above its supercritical point (1100 psi, 31°C). These difficulties with CO_2 foam is overcome by adding N_2 in small fraction to enhance the foam generation of CO_2 at supercritical conditions. This study shows how the addition of small quantity of N_2 helps in generating the CO_2 foam and performance of the CO_2/N_2 mixture foam in enhanced oil recovery. To investigate the performance of CO_2/N_2 foam, core-flooding experiments were conducted at elevated pressure and temperature condition (higher than supercritical CO_2 - 50°C and 1500 psi) in sandstone cores. Fluorosurfactant (FS-51) was used as a foaming agent, and n-decane was used as model oil in all the experiments. The selection of foam quality and N_2 fraction was optimized based on foam generation and stability tests. Every gas or foam flooding was preceded by seawater injection to simulate the behavior in the reservoir. The results from the core-flood experiments showed that the CO_2 and CO_2/N_2 foam flooding recovered an additional 34-40% of Original Initial Oil in Place (OIIP) indicating that foam flooding succeeded in producing more oil than pure CO_2 gas injection processes. Additionally, the performance CO_2/N_2 foam injection was better than CO_2 foam injection.

Keywords : CO_2/N_2 foam, enhanced oil recovery (EOR), supercritical CO_2, sweep efficiency
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020