

Oil Recovery Study by Low Temperature Carbon Dioxide Injection in High-Pressure High-Temperature Micromodels

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Abstract : For the past decades, CO₂ flooding has been used as a successful method for enhanced oil recovery (EOR). However, high mobility ratio and fingering effect are considered as important drawbacks of this process. Low temperature injection of CO₂ into high temperature reservoirs may improve the oil recovery, but simulating multiphase flow in the non-isothermal medium is difficult, and commercial simulators are very unstable in these conditions. Furthermore, to best of authors' knowledge, no experimental work was done to verify the results of the simulations and to understand the pore-scale process. In this paper, we present results of investigations on injection of low temperature CO₂ into a high-pressure high-temperature micromodel with injection temperature range from 34 to 75 °C. Effect of temperature and saturation changes of different fluids are measured in each case. The results prove the proposed method. The injection of CO₂ at low temperatures increased the oil recovery in high temperature reservoirs significantly. Also, CO₂ rich phases available in the high temperature system can affect the oil recovery through the better sweep of the oil which is initially caused by penetration of LCO₂ inside the system. Furthermore, no unfavorable effect was detected using this method. Low temperature CO₂ is proposed to be used as early as secondary recovery.

Keywords : enhanced oil recovery, CO₂ flooding, micromodel studies, miscible flooding

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