

A Simple Computational Method to Estimate Minimum Miscibility Pressure (MMP) for CO₂ Enhanced Oil Recovery (CO₂ EOR)

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A computational method to estimate MMP for CO₂ EOR is developed based on thermodynamic calculations to describe phase behavior of CO₂-crude oil multicomponent mixture. Thermodynamic analysis provides fast and effective tools to predict the miscibility of CO₂ and crude oil mixtures, which is measured by time-consuming experiments. We suggest that MMP at a reservoir temperature should correspond to the Upper Critical Solution Pressure (UCSP) at the given temperature. Since MMP is a critical property of a multicomponent mixture, its accuracy depends on the robustness of the equation of state used to model the phase behavior near the critical pressure and temperature. In this study, Predictive Peng-Robinson equation of state (PPR78 EOS) is used, where binary interaction parameters (k_{ij}) are temperature-dependent, and it lead to better approximations to phase behaviors of real mixtures. The MMP estimation based on composition data and the reservoir temperature showed a good agreement with experimental slim-tube test results within average error of 5%.