

Measurements and Calculation of CO₂-Reservoir Oil Minimum Miscibility Pressure using a Novel Rising Bubble Apparatus

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CO₂-oil Minimum Miscibility Pressure (MMP) is the key parameter for the design and operations of successful CO₂ miscible flood project. The study objective is to develop mathematical models of predicting pure CO₂ -oil MMP. Part-1 of the study consisted of the experimental work based on the Rising Bubble Apparatus to measure CO₂-oil MMP for different Omani light oil reservoirs and part-2, contained the development of mathematical models by using the Artificial intelligence techniques based on the resulting MMP values obtained from the experimental work in Part-1 and the literature MMP data. The Artificial intelligence techniques utilized the Artificial Neural Network (ANN) and the Particle Swarm Optimization (PSO) methods. The resulting percent deviations of 4.69 and 4.33 were achieved by using the developed ANN and PSO models for the Omani oil samples MMP data respectively. Thus, the developed ANN and PSO models resulted in more accurate predictions of CO₂-oil MMP than the literature models. The ANN and PSO models were constructed based on the approach that the literature CO₂-oil MMP data were used for the training process of the models and the experimental CO₂-oil MMP results for the Omani oil samples were utilized for the testing of models. This gives an advantage to the developed ANN and PSO models that they are capable of being applied for Oman light oil reservoirs and more widely. The developed mathematical models provide an accurate and fast method for the prediction of CO₂-oil MMP.