

## **Phase Behaviour Modeling of Asphaltene Precipitation for Heavy Crudes**

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Asphaltenes are heavy hydrocarbon molecules that exist naturally in petroleum reservoir fluids. Asphaltene precipitation is an important problem during oil production, because it can result in formation damage and plugging of wellbore and surface facilities. Previous studies that have been used solid model for predicting of the asphaltene precipitation under gas injection condition have not shown a reasonable agreement with the experimental data for the whole range of concentration. In addition, the impacts of different characterization methods on the accuracy of model predictions are not well understood. Moreover, there are no recorded attempts for measuring and predicting the asphaltene precipitation in the Sarvak oil reservoir, located in the south-west of Iran, as a potentially problematic heavy oil reservoir.

In this work, a thermodynamic approach is used for modeling the phase behavior of asphaltene precipitation. The precipitated asphaltene is represented by an improved solid model, while the oil and gas phases are modeled with an equation of state. The PR-EOS as well as SRK-EOS along with different characterization methods was used to perform flash calculation. Then, the onset point and the amount of precipitated asphaltene were predicted. A computer code for improved solid model has been developed and, used for predicting of asphaltene precipitation data reported in the literature as well as the data obtained from asphaltene precipitation experiments performed on Sarvak crude under pressure depletion, gas or solvent injection conditions. The model parameters, obtained from sensitivity analysis as well as different characterization methods, were applied in the thermodynamic model. It has been found that the model results describe the experimental data reasonably well under pressure depletion condition. Also, the model is able to predict the asphaltene precipitation data with close agreement for gas injection and solvent addition conditions. Especially, for the maximum value of asphaltene precipitation and for the trend of the curve after the maximum, good agreement was observed, which can rarely be found in the available literature.