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Evaluation of PC-SAFT model and Support Vector Regression (SVR) approach in prediction of asphaltene precipitation using the titration data

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Abstract

Asphaltene deposition in porous media, wellbore and surface facilities has been a severe problem in petroleum industry which causes considerable remediation costs annually. Asphaltenes are heavy and polydisperse fractions of crude oil which are insoluble in n-alkanes such as n-heptane. In this work, three Iranian crude oils were prepared for titration experiments with n-pentane, n-heptane and n-dodecane at different solvent ratios and constant temperature. The experimental data were correlated by perturbed chain form of statistical associating fluid theory (PC-SAFT). The association of asphaltene molecules has been considered in this model with adjusting the uncertain parameters (such as association energy and association volume of asphaltene pseudo component) to match the experimental data. PC-SAFT parameters for other non-associating pseudo components have been calculated using the correlations proposed in literature. The present study also evaluated the performance of SVR method as a supervised learning approach in prediction of asphaltene precipitation. Deviation of proposed models has been validated using the statistical evaluation criteria and graphical analysis. The results show that the proposed models have AAD values less than 0.073 and a high potential in prediction of asphaltene precipitation.

Key words: Asphaltene precipitation, PC-SAFT, SVR, Leverage approach

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