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A contribution to predicting the properties of petroleum fluids

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Abstract

Petroleum fluids (crude oil, gas condensate, and their derivatives) are highly complex natural mixtures in the sense that they contain too many components to be identified and analyzed. This is why they are difficult to represent thermodynamically. Nevertheless, such mixtures can be characterized after splitting them into fractions and after determining the properties of each fraction (e.g., molecular weight, boiling point, density, viscosity, etc.). Phase equilibria in such mixtures are usually computed by standard tools such as the pseudo-component method, which assumes that each fraction is a mixture of predefined pure components. The sheer number of components and/or their poorly defined structure require simplifications, which are more or less justified for fractions of a molecular weight higher than 100. Phase equilibrium calculation is therefore simplified by substituting these fractions with corresponding mixtures of well-defined model components, in order to evaluate averaged characteristic parameters.

Based on our previous research, here we present a simplified method for characterizing heavy petroleum fractions and for predicting vapor–liquid equilibria. The required input data include complete TBP analysis, PNA analysis, and density data, preferably for each sub-fraction. Known thermodynamic procedures are used to estimate the critical data, acentric factor, and molecular weight for the model compounds. The calculated thermodynamic properties are in a very good agreement with the corresponding experimental values for light to medium crude oil fractions. Additional experimental data are needed to obtain more reliable results for fractions with a TBP above 600 K.

Biography

G. Bogdanić and I. Wichterle are scientific researchers at the Institute of Chemical Process Fundamentals, Prague. Both publish extensively in the field of phase equilibria.
GB received her PhD from Institut Français du Pétrole, Paris, and completed postdoctoral studies at Technical University of Denmark, Lyngby. She is the (co)author of 3 books, 67 scientific papers, 2 patents, and the editorial board member of 3 reputed journals.
IW received his PhD from the Czechoslovak Academy of Sciences. During his postdoc stay at Rice University, Houston, he discovered a new phenomenon in critical region. He has authored 114 papers and 27 books/monographs.