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Measurement of VLE data for binary lipids systems

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Abstract

Consistent physical and thermodynamic properties of pure components and their mixtures are important for process design, simulation, and optimization as well as design of chemical based products. In the case of lipids, our previous works[1-3] have indicated a lack of experimental data for pure components and also for their mixtures. To contribute in this area, experimental data were obtained using the Differential Scanning Calorimetry (DSC) technique for isobaric vapor-liquid equilibrium (VLE) of two binary mixtures at two different pressures (1.2 and 2.5 KPa): system 1 [monoacylglycerol (monocaprylin) + fatty acid (palmitic acid)] and system 2 [monoacylglycerol (monocaprylin) + fatty ester (methyl stearate)]. System 1 is relevant in the purification steps of the deodorizer distillates while system 2 is relevant in the purification steps of biodiesel and bioglycerin. A non-ideal behavior is revealed for both systems at the two different pressures, with azeotrope behavior observed and confirmed but the relative volatility analysis. Available thermodynamic consistency tests for TPx data were applied before performing parameter regressions for Wilson NRTL, UNIQUAC and original UNIFAC models. The relevance of enlarging experimental databank of lipids systems data in order to improve the performance of predictive thermodynamic models was confirmed in this work by analyzing the calculated values of original UNIFAC model. A new group for original UNIFAC model is created aiming to improve the representation of the experimental data by this predictive model.

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