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Oil Products Desulfurization by 1-Butyl-3-Methylimidazolium Tetrachloroaluminate Ionic Liquid: Experimental Study and Thermodynamic Modelling

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Abstract – Presence of sulfur compounds in fuels causes various problems like severe environmental threats, corrosion, etc. Therefore, desulfurization is very important process which leads to increase of the safety in using fuels in industrial processes. In this communication, the performance of the ionic liquid 1-Butyl-3-Methylimidazolium Tetrachloroaluminate [BMIM][ALCL₄], as a solvent in extractive desulfurization process from gasoline, kerosene and gas oil at different conditions has been investigated. Results show, for example, in the ternary systems of gasoline, sulfur compounds and ionic liquid, the best contact time is 5 minutes, the appropriate temperature is room temperature and the highest efficiency is obtained in the highest mass ratios of solvent to fuel. In addition, a seven stage extractive desulfurization has been proposed to improve the sulfur separation efficiency. Finally, equilibrium data of liquid-liquid systems have been correlated with some local composition models, namely NRTL, Wilson and UNIQUAC models. The agreement between the results of the models and the experimental data is found to be good.

Keywords - Extractive Desulfurization; Liquid-Liquid Equilibrium; Ionic Liquid (IL); Sulfur Compounds; Local Composition Models; Separation.

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