PRELIMINARY MEASUREMENTS OF THE THERMOPHYSICAL PROPERTIES OF SOME IONIC LIQUIDS WITH WATER FOR ABSORPTION CHILLERS

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Introduction: Ionic liquids (IL) are considered today to constitute the class of liquids with the highest potential to revolutionize the chemical industry, as they constitute innovative fluids for chemical processing which are generally non-flammable and non-volatile at ambient conditions, and, thus, perceived as "green" solvents [1]. The ionic liquids emerged in recent years as the great alternative in the chemical industry as solvent, reagents, co-solvents, electrolytes, lubricants, etc., and permit the retrofitting of existing equipment with new replacement working fluids, to decrease the environmental impact, or, in our opinion, increase the energetic efficiency of the chemical processes. They have been recently proposed as absorbents in absorption and refrigeration cycles [2]. On the other hand, also recently a great attention has been redirected toward recovery of waste heat looking for working pairs with natural refrigerants that can be characterized by a well-balanced set of properties.

Precise knowledge of the thermophysical properties of refrigerants and absorbents, as well as mixtures of these, is essential for the necessary calculations in the simulation of absorption refrigeration cycles and the design of the absorption chillers. But, these properties have to be accurately and carefully measured, because a wrong method of synthesis of the ionic liquid or an inadequate procedure of measurement of the properties can lead to erroneous data, as shown by the discrepancies between data that can be found in the literature [3].

In this paper, some preliminary data of density and viscosity of 1-butyl-3-methylimidazolium tetrafluoroborate [bmim][BF_4] and the mixture [bmim][BF_4] + water have been experimentally measured and compared with data reported in literature.

Experimental: density and viscosity of the mixture [bmim][BF_4] + H_2O were experimentally measured at different temperatures and compositions. Ionic liquid was synthesize and adequately characterized in our laboratory.

Density was experimentally determined using an Anton Paar vibrating-tube densimeter (DMA60/512 P) in a range of temperatures from 20 ºC to 100 ºC at 1 bar. Viscosity was determined using a falling ball viscometer Haake in a range of temperatures from 20 ºC to 100 ºC.

Experimental results were compared with data reported in literature [4-6].

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