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Thermogravimetric measurement of deep eutectic solvents vapor pressure

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Abstract

Knowledge of volatility of solvents in general and ionic liquids analogues in particular is crucial for thermodynamic modelling and proper solvent selection. In this study, the vapor pressures of a selected set of ionic liquids analogues known as deep eutectic solvents (DES) were investigated by thermogravimetric analysis (TGA). The experimental measurements were conducted for the practical temperature range of 343.15 to 393.15 K. In general, measurements revealed that DESs have low but detectable vapor pressure. Compared to some common ionic liquids, DESs have higher vapor pressure. It is interesting to know that the vapour pressure-temperature relationship of DESs is more complex than that of molecular liquids as well as that of most ionic liquids. The conventional Antoine model was not able to explain the variation of vapor pressure with temperature. However, the vapor pressure was found to exhibit a noticeable trend with the DES critical temperature which was estimated theoretically. The Wagner vapor pressure model was able to predict the vapor pressure with an average %AAD of 2.89%.

Keywords: vapor pressure; deep eutectic solvents; TGA; glycerol; choline chloride; Wagner model

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