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Environmental Chemistry 2019: Thermodynamic and physical study of [hmim]Cl + (1-pentanol or ethylene glycol) mixtures at various temperatures - Fakhri Kermanpour, Bu-Ali Sina University

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Abstract

Densities, viscosities, and refractive indices for pure compounds of 1-hexyl-3-methyl imidazolium chloride ([hmim]Cl) (IL), 1-pentanol, and ethylene glycol (EG), along with their binary mixtures of {x_1[hmim]Cl + $x_2$1-pentanol} and {x_1[hmim]Cl + x_2EG} were measured over the entire composition range at temperatures (293.15 to 333.15) K and ambient pressure. The excess molar volumes and viscosity deviations for the binary mixtures were calculated from the experimental data. The excess molar volume values of {x_1[hmim]Cl + $x_2$1-pentanol} mixture are negative in the entire composition range at all temperatures, and increase with increasing temperature in the alcohol rich region and decrease with increasing temperature in the IL rich range. The excess molar volumevalues of {x_1[hmim]Cl + x_2EG} mixture are positive in the alcohol rich range and negative in the IL rich range at all temperatures, and decrease with increasing temperature. Viscosity deviations of both mixtures are negative over the entire composition range in all temperatures and decrease with increasing temperature. The obtained excess molar properties were correlated by Redlich– Kister equation, and the excess molar volumes were correlated using Prigogin- Flory- Patterson (PFP) model. The fitting parameters and standard deviations were determined.

Ethylene Glycol

TCC's Ethylene Glycol (MEG) is a harmful, lackluster, for all intents and purposes unscented, low-instability, low-consistency, hygroscopic fluid. It is totally miscible with water and numerous natural fluids. The hydroxyl bunches on glycols experience the typical liquor science, giving a wide assortment of potential subordinates. This science licenses ethylene glycol to go about as a transitional in a wide scope of responses. Particularly huge is pitch arrangement, incorporating the buildup with dimethyl terephthalate or terephthalic corrosive bringing about a polyester gum (PET) for soda pops and food bundling.

The across the board utilization of ethylene glycol as a radiator fluid depends on its capacity to bring down the point of solidification when blended in with water. The physical properties of ethylene glycol-water blends are thusly critical. Ethylene glycol has various end utilizes that incorporate the creation of polyester filaments and pitches, as an added substance in chilled water cooling frameworks, geothermal warming/cooling frameworks, and as a significant forerunner to polyester strands and saps in the plastics business.

Description: TCC's

Ethylene Glycol (MEG) is a natural compound generally utilized as a car radiator fluid and the forerunner to polymers. In its unadulterated structure, it is an unscented, lackluster, sweet fluid. Ethylene glycol is harmful, and ingestion can bring about death.

Ethylene glycol is created from ethylene, by means of the transitional ethylene oxide. Ethylene oxide responds with water to create ethylene glycol as indicated by the synthetic condition:

C2H4O + H2O → HO–CH2CH2–OH

This response can be catalyzed by either acids or bases, or can happen at nonpartisan pH under raised temperatures. The most significant returns of ethylene glycol happen at acidic or impartial pH with a huge abundance of water. Under these conditions, ethylene glycol yields of 90% can be accomplished. During the procedure some side-effects are shaped: Diethylene Glycol (DEG) and Triethylene Glycol (TEG). These side-effects are isolated from MEG through refining.

The significant end employments of ethylene glycol are as a liquid catalyst, which represents over half of ethylene glycol's business utilizes, and as crude material in the creation of polyester filaments and plastics, essentially PET, which represents 40% of all out ethylene glycol utilization. Since this material is economically accessible, it finds numerous specialty applications.

Applications

TCC's Ethylene Glycol's significant end utilizes are as a liquid catalyst, which represents over half of ethylene glycol's business use, and as crude material in the creation of polyester strands and plastics, mostly PET, which represents 40% of all out ethylene glycol utilization. Since this material is efficiently accessible it finds numerous specialty applications.

Ethylene glycol is a mode for convective warmth move in autos and fluid cooled PCs. It is likewise generally utilized in chilled water cooling frameworks that place either the chiller or air

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handlers outside, or frameworks that must cool beneath the frosty temperature of water. In geothermal warming/cooling frameworks, ethylene glycol is the liquid that transports heat using a geothermal warmth siphon. The ethylene glycol either gains vitality from the source, or disseminates warmth to the source, depending if the framework is being utilized for warming or cooling.

Because of its low the point of solidification, ethylene glycol opposes freezing. A blend of 60% ethylene glycol and 40% water doesn't freeze until temperatures dip under - 45°C (- 49° F).

Recent Publications

1. Garcia-Mardones M, Cea P, Gascon I, Lafuente C (2014) Thermodynamic study of the surface of liquid mixtures containing pyrimidinium-based ionic liquids and alkanols. Journal of Chemical Thermodynamics 78:234-240.
2. Kermanpour F, Iloukhani H, Javanshad M (2013) Measurement and modeling the excess properties of binary and ternary mixtures containing [Hmim][BF4], 2-methyl-2-propanol, and propylamin compounds at 298.15 K using PFP theory. Journal of Molecular Liquids 188:22-27.
3. Kermanpour F, Sharifi T (2014) Measurement and correlation of the excess properties of ternary mixture of {x_1[hmim][BF4] + $x_2$1-propanol + $x_3$2-propanol} at different temperature. Journal of Chemical & Engineering Datat 59:1922-1929.
4. Zhang YX, Li SN, Zhai QG, Jiang YC, Hu MC (2016) Physiochemical and excess properties of binary mixtures of (1-alkyl-3-methylimidazolium chloride/bromide + ethylene glycol) at T = (288.15 to 333.15) K. Chemical Papers 70:384-394.
5. Aktar Sh, Rahaman AM, Hossain MS, Akhtar Sh (2015) Excess molar volumes and deviations in viscosity of the binary mixtures 1-pentanol + aromatic hydrocarbons at *T* = 298.15 K. European Scientific Journal 11:1857-1881.

Biography

Fakhri Kermanpour has completed her PhD from Isfahan University of Technology on 2000. She is a Faculty Member at Bu-Ali Sina University in Iran, from 2000 to present. She has published more than 20 papers in reputed journals.

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