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Intensification of extractive distillation using ionic liquids as solvent

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The objective of this work is to design a novel efficient solvent for the intensification of dehydration process of ethanol by extractive distillation using ionic liquids. The vapor – liquid equilibrium (VLE) behavior of ethanol - water mixture in the presence of different types of solvents such as ethylene glycol, [MSM] [OAc] and [HMIM] [Cl] was defined using NRTL thermodynamic model, the required experimental VLEdata for the regression of binary interaction parameters between different substances of mixtures are considered.

The sensitivity analysis of key parameters reflux ratio and solvent ratio is carried out, allowing us to define the optimized operating conditions in the presence of pure ionic liquids [MSM] [OAc] and [HMIM] [Cl]. It is shown that the quantities of solvents can be reduced considerably, and therefore, the energy required in the process could be reduced notably.

After a comparative study among the three pure solvents, it is confirmed that the ionic liquid [MSM] [OAc] is the best solvent able to separate ethanol with a high purity of 99.98%. Also to overcome difficulties in the regeneration of ionic liquids, we proposed to use a solvent mixture containing ethylene glycol and ionic liquid and it is revealed that the optimum concentration of the ionic liquid in the solvent mixture is about 8% to get ethanol purity of 99.9%.

Biography:

Hassiba Benyounes has been an assistant professor in the Department of Chemical Engineering of University of Science and Technology of Oran, Algeria, since 2004. She received her PhD degree in chemical engineering in 2003 from State Academy of Fine Chemical Technology M.V. Lomonossov. She is a member of Laboratory of Physical Chemistry, Material, and Environment in Algeria and collaborates with the research group of Prof. Xavier Joulia at the Laboratory of Chemical Engineering of Toulouse. Her research field concern modeling and simulation in process system engineering, with particular interest in design and development of extractive distillation.