Ultra Purification of Ionic Liquids by Melt Crystallization
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Abstract

Ionic liquids (ILs) have received a great increase in attention in the fields of engineering during last decade due to their unique properties. ILs are a very important class of non volatile environmentally friendly solvents (T_m< 100°C) in (bio)catalysis -applicable to many ionic, polar and non polar structure groups- and as efficient electrolytes [1]. The applications range from electrochemistry, sensors, analysis, separation techniques to catalysis and reaction engineering. Furthermore it is most important to realize low production cost including efficiently techniques for purification and ultra purification.
The paper will present results of purification and ultra purification of EMIM-Chloride and EMIM-Bromide (EMIM: 1-*e*thyl-3-*m*ethyl-*im*idazolium) by melt crystallization. Different techniques for purification are discussed: zone melting, layer crystallization and dry sweating in lab scale [2] und layer crystallization for static and dynamic crystallization conditions in pilot scale. Results are used for basic engineering of large scale plants. In the case of EMIM-Chloride segregation coefficients are in the range of $0,05<k_{seg}<0,6$ depending on crystallization rate, yield, feed impurity concentration and techniques used. The crystallization behavior of purified Ionic Liquids will be discussed in detail in respect those of organic substances with similar melting points. Purification potential of EMIM-Chloride will be discussed in respect to different crystallization techniques and different scales used for crystallization.
The excellent purification results of EMIM-Chloride offer a high purification potential of melt crystallization techniques for Ionic Liquids as a new innovative class of solvents and reactants. Melt crystallization is a very efficient method to produce in different scales from 0.5 g up to 1000 kg ultra pure Ionic liquids w_{IL} >99,99%.

Keywords: Ionic Liquids, ultra purification, crystallization, green engineering, emim chloride