

Insights on the Ionic Liquids Structure-Property Relationship

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Ionic liquids (ILs) are composed of ions, and as a result there are a large number of potential compounds to be synthesized by simple structural rearrangements. Able to be either inert, acting only as solvents or designed to actively participate in a large range of chemical reactions, these ionic compounds have often been considered as “*green solvents*” because of their negligible vapor pressures and, in many cases, low flammability, when compared with common organic solvents. Moreover, the ionic nature of ILs is the main characteristic responsible for some of their most outstanding properties, namely a high ionic conductivity, high thermal and chemical stability, and enhanced solvation ability for a large array of compounds. At the same time, the combination of different ions, sustained by a wide chemical diversity, allows the tailoring of their properties, making them *quasi* specific fluids for a particular application, thus “*designer solvents*”. Nonetheless and despite the large number of works outing ionic liquids as “*designer solvents*”, the number of studies dealing with their structural design, besides the simple combination of different cations and anions, is, at this point, surprisingly scarce. In this work the understanding of the structure-property relationship will be evaluated and discussed beyond the cation-anion combination. In particular the effect of cation isomerism or quasi-isomerism, the presence/absence of the aromaticity and the influence of the cation's central atom in a large range of physical, chemical and biological properties is presented.

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