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Novel purine-based ionic liquids as potential hydrotropes

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PURPOSE OF THE ABSTRACT

Ionic liquids (ILs) are alternative solvents composed of a large organic cation and an inorganic or organic anion. Their ionic nature enables to combine different IL cation-anion arrangements leading to the design of unique and tunable compounds. Over the past years, the use of renewable and eco-compatible feedstock for the design of ILs is being increasingly encouraged. Purines are the most frequent N-heterocycles in nature. However, most purines have poor solubility in both water and organic solvents, which limits their application.[1] By forming salts of purines it is often possible to improve their solubility.[2] This opens new prospects in the application of purines, such as their use as raw feedstock for the synthesis of ILs. The employment of purines as ILs building-blocks can potentially enable the design of novel biobased ILs while simultaneously increasing the solubility of purines. In this work, four purines (theobromine, theophylline, xanthine, and uric acid) were used to design biobased ILs with tetrabutylammonium as a cation, ultimately aiming to improve the solubility of purines while simultaneously unlocking novel applications for these compounds.[3] Their water-solubility, decomposition and melting temperatures and ecotoxicity against the Raphidocelis subcapitata microalgae were evaluated. In comparison to their free respective purines, the ILs afforded a molar aqueous solubility enhancement ranging from 53 to 870-fold. The hydrotropic capacity of the synthesized ILs was evaluated by adding a poorly water-soluble biomolecule, 4-hydroxy-3-methoxycinnamic acid (also known as ferulic acid), to different IL solutions. The synthesized ILs displayed a hydrotropic effect regarding ferulic acid, greatly improving its solubility in aqueous solution (up to 146-fold).

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FIGURES

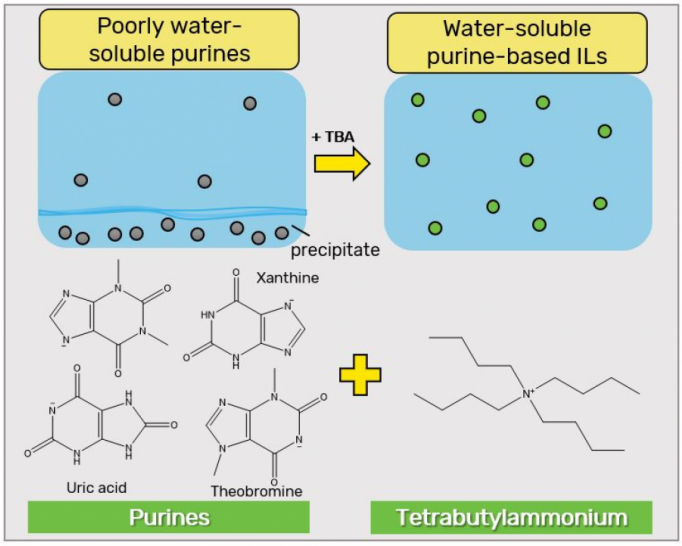

FIGURE 1

Purine-based ILs as solubility enhancers

Purine-based ILs improve the solubility of their respective purines while simultaneously being able to enable the solubility of other biomolecules.

FIGURE 2

KEYWORDS

Synthesis | Ionic liquids | Hydrotropy | pH-dependent solubility

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