Task-specific ionic liquids as smart additives for nanoparticles

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The increasing application of nanoparticles (NPs) in various fields has led to a search for more useful nanomaterials, and thus, the quality requirements for NPs are becoming more stringent. Unfortunately, the prevalent methods for fabrication of NPs do not meet the essential requirements set for modern (bio)materials and as such cannot be widely used in (bio)technology applications because these procedures are often uneconomical and contain toxic reagents. However, ionic liquids (ILs) are a pivotal option for the development of NPs with good morphology and bioapplicability. The synthesis of NPs in the presence of ILs is increasingly recognized as eco-friendly and more effective than prevalent methods.

Here, we focused on the use of task-specific ionic liquids (TSILs) to prevent the aggregation and agglomeration of the nanostructures. We have research TSILs that contain various functional group as follows: (*i*) pharmaceutical active anion, salicylate; (*ii*) component of natural origin in the cation part (–)-menthol; (*iii*) or alkoxymethyl substituent (Figure 1).

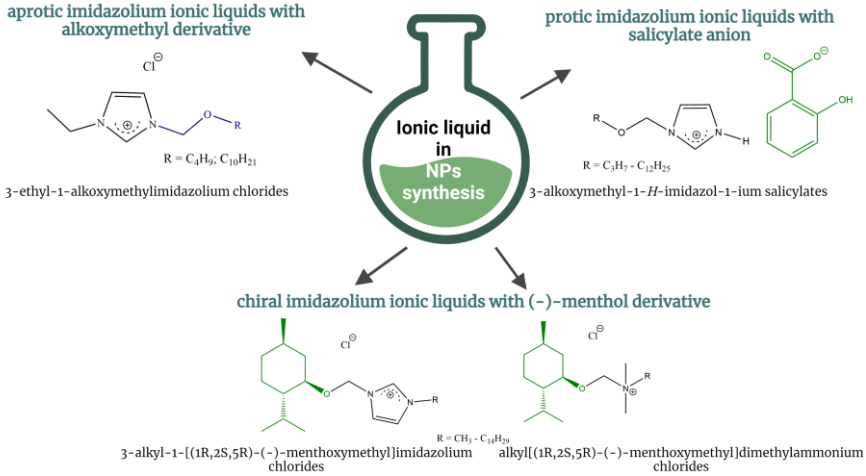

Figure 1: Type of task-specific ionic liquids use for stabilizing NPs

TSILs were used for the synthesis of nanoparticles (NPs) and acted as stabilizers for them as well as interface their shape and size. The precise control of NPs size distribution together with a better understanding of the chemical behaviour of those nanomaterials (NMs) are becoming progressively more essential to grow the utility of NPs in various applications. Morphology and particle size of the metal NPs are largely influenced by the factors affecting their stability. The particular advantages of using TSILs are mainly due to their mono-dispersive and non-agglomerative behaviours that could be possible through the stabilization of metallic NPs by cations and/or anions of ILs.

For instance, we have synthesized AgNPs using an aqueous extract of green tea Camellia sinensis and we have used 3-alkoxymethyl-1-*H*-imidazol-1-ium salicylates as silver nanoparticles (AgNPs) stabilizers. Optical characterization revealed that we have obtained small (40-75 nm) and stable for over 20 days AgNPs with the addition of protic ionic liquids compared to the unsterilised sample.

Using synthesized by us TSILs lead to prevent the aggregation and agglomeration of the nanostructures, and affect their specific features, including optical and structural what is crucial in (bio)technological applications.

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