Confining ionic liquids in solid supports for repellent surfaces and catalysis Yaraset Galvan, Nicolas Vogel, Friedrich-Alexander University, Erlangen Germany.

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The peculiarity of the ionic liquids is that they are liquids at room temperature or have melting points below 100°C while keeping their ionic nature and with it some ionic properties, as ultra-low vapor pressures, non-flammability, and high thermal stability [1,2]. This makes them an advantageous tool for many applications. From solvents in catalytic reactions, to non-volatile solvents in lithium-ion batteries and lubricants in repellent surfaces, ionic liquids have been proved to be highly beneficial in the engineering industry [3,4].

Transferring the advantageous properties of the ionic liquids in the design of repellent surfaces can result in long-lasting and robust repellent surfaces. This is possible by fabricating slippery liquid-infused repellent surfaces, where a highly stable omniphobic surface is created by locking a lubricating liquid (in this case the ionic liquid) in nano- or micro-structures, which are previously formed in the substrate of interest [3]. In the same way, confining ionic liquids in a surface benefits hybrid catalysis, where a molecular catalyst is dissolved in a supported ionic liquid [5].

Liquid films that are strongly confined to a solid substrate use well-matched surface chemistry and liquid to retain the latter in place [6]. By controlling the interface properties, a stable interaction of the ionic liquid with the support is ensured and the loss of the ionic liquid can be avoided [6,7].

We propose to further maximize the chemical affinity of the ionic liquid to a solid support by creating a polymer network with a chemical composition matching that of the ionic liquid.

The strategy consists on co-polymerize non-ionic units of active ester, as pentafluorophenyl acrylate, with crosslinking units, as benzophenone acrylate, following by a post-polymerization functionalization of the polymeric chain with an ionic liquid containing an amino group in its structure. The amine group carries out a nucleophilic substitution of the active group [8]. The final product is a crosslinked polymeric network with the same chemical composition of the ionic liquid. Such a network is capable to be swollen with ionic liquid and retain it in its structure in the fashion of a super-absorbent material.

References


