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Can surface-active ionic liquids based on caprylic acid be a green alternative to surfactants in detergent production?

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Surfactants play a ubiquitous role in numerous everyday products, including detergents, cosmetics, and household cleaners, among others. Their diverse applications stem from the amphiphilic nature of surfactants, allowing them to lower surface tension, wet various surfaces, and form aggregates in different solvents. There is growing interest in surface-active ionic liquids (SAILs), which behave like surfactants but offer distinct advantages. The physicochemical properties of these compounds can be tailored by selecting the cation or anion. Moreover, natural compounds such as caprylic acid are gaining attention for their antimicrobial properties, aligning with sustainability goals. Caprylic acid, extracted from mammalian milk or plant oils, demonstrates promising antimicrobial activity against various pathogens. However, its limited solubility and odor necessitate the development of new derivatives.

The conducted research focuses on evaluating SAILs derived from caprylic acid to elucidate their antimicrobial effectiveness and surface activity. Synthesizing these compounds allows for exploring structure-function relationships, aiding in the selection of multifunctional compounds suitable for various applications. To assess their surface activity, various parameters were determined, including critical micelle concentration (CMC), surface tension at CMC (γC_{MC}), surface tension reduction efficiency (pC_{20}), and free energy of adsorption (ΔG^0_{ads}). Additionally, the wetting tendency of SAILs was evaluated by measuring contact angle (CA) values.

Based on the research results, it is concluded that synthesized SAILs exhibit higher surface activity than conventional cationic surfactants like didecyldimethylammonium chloride (DDAC). In light of this, SAILs can replace these surfactants while also serving as a greener alternative.