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Designing biological fluid inspired molecularly crowded ionic liquid media as sustainable packaging platform for Cytochrome c

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Abstract

Biological fluid is highly crowded due to the presence of various biomolecules. Therefore, it is essential to study the effects of molecular crowding agents to probe the behavior of a protein in cell-like environment. Inspired by biofluids, herein, a molecularly crowded environment is created in presence of ionic liquid (IL) envisaging sustainable protein packaging. Different molecules, such as Ficoll, sucrose, and polyethylene glycol were chosen as crowding agents, whereas, Choline dihydrogenphosphate (Cho-Dhp) was selected as IL due its known utility for protein stabilisation. Interestingly, molecularly crowded IL media enhanced the stability and catalytic activity (1.5-fold higher) of Cytochrome c (Cyt c) as compared to IL alone and crowding agents without IL. A similar trend was observed when the activity was recorded at 100 °C and when stored at room temperature for 30 days. The results were well corroborated with circular dichroism spectra which indicated that tertiary structure of Cyt c was disturbed in presence of the crowding agents but with the addition of IL, native structure of Cyt c was regained. Moreover, Cyt c dissolved in molecularly crowded IL media was regenerated successfully without affecting the melting temperature of the protein, confirming the suitability of the molecularly crowded IL media as a potential and ecofriendly packaging system for Cyt c..

Biography:

Kavya Bhakuni has completed her Master's in Chemistry from Indian Institute of Technology Delhi (IIT-Delhi) at the age of 23 years. She is currently pursuing Ph.D in chemistry from University of Delhi (DU). She has published 2 research papers in International Journal of Biological Macromolecules (Int. J. Biol. Macromol.) and one in Chemical Communications (Chem. Comm.)

Speaker Publications:

1. "Sustainable Solvothermal Conversion of Waste Biomass to Functional Carbon Material: Extending its Utility as a Biocompatible Co-Solvent for Lysozyme"; ACS Biomaterials Science and Engineering; 2020.
2. "Expanding the Potential Role of Deep Eutectic Solvents toward Facilitating the Structural and Thermal Stability of α-Chymotrypsin"; ACS Sustainable Chemistry & Engineering; vol 8, 2020.
3. "Implications of Imidazolium-Based Ionic Liquids as Refolding Additives for Urea-Induced Denatured Serum Albumins"; ACS Sustainable Chemistry & Engineering; 2019.
4. "Strategic planning of proteins in ionic liquids: Future solvents for enhanced stability of protein against multiple stresses"; Physical Chemistry Chemical Physics; vol 21, 2019
5. "Designing biological fluid inspired molecularly crowded ionic liquid media as sustainable packaging platform for Cytochrome c"; Chemical Communications; vol 55, 2019.

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