

Title: Improving the activity and stability of proteins/enzymes in presence of neoteric solvents for facile biocatalysis

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Abstract:

There is considerable interest in the use of structurally stable and catalytically active enzymes, in the pharmaceutical and fine chemicals industries. However, harsh process conditions, such as temperature, pH, and the presence of organic solvents, are the major barrier to the effective use of enzymes in biocatalysis. We demonstrate the suitability of cholinium-based ionic liquids (ILs) and deep eutectic solvents (DESs) as potential media for proteins and enzymes to improve their stability and activity. ILs and DESs-assisted enzymes showed significantly higher activity and stability against several external stimuli, such as high temperature (120°C), oxidative stress, high pH range and biological (trypsin) and chemical denaturants (GuHCl and urea,) compared to the native enzyme. These results are highly useful tools for improving the biocatalytic and extraction processes. Based on the observed results, the most efficient ILs/DESs were further chosen to extract various proteins (collagen, bacteriorhodopsin) directly from sustainable biomass sources (fish industry waste). Compare to the conventional method, DES-extracted proteins were found with higher yield and purity. The observed results support the suitability of neoteric solvents as efficient and green media for improving protein packaging, biorefinery, biocatalysis and drug delivery applications.