Deep eutectic solvents: Potential new media for lipase-catalyzed reactions?

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In recent years, potential green alternative media to organic solvents for lipase-catalyzed reactions have been evaluated Thereby, ionic liquids (IL) have emerged as fascinating media for enzymatic reactions. One drawback to the wider development of these solvents in biocatalysis is their cost and the difficulty of product recovery. Recently, a novel medium with similar properties to IL but with additional advantages regarding cost, environmental impact and synthesis has been proposed: This novel medium correspond to Deep Eutectic Solvents (DES) which are made from the association of an ammonium salt and a hydrogen-bond donor. In these new solvents, the hydrogen-bond donor interacts with the anion, inducing a depression in the melting point of the mixture. One of the most explicit examples is the synthesis of the mixture between choline chloride (Tm = 247℃) and urea (Tm = 133℃) with 1:2 molar ratio resulting in a deep eutectic solvent having a room temperature melting point (12℃). This present study aimed at analyzing the advantages and limitations of several DESs as 'green solvents' for biotransformation using lipases. Our first objective was to evaluate the alcoholysis of vinyl laurate with various aliphatic alcohols of different chain lengths with immobilized *Candida antarctica* B lipase. In this specific case, we noticed that a preliminary grinding of the catalyst was crucial in order to get an efficient reaction kinetic. Moreover, control of water content from air moisture was essential before starting our model reaction in this kind of mixture. The results of lipase activity revealed that all DESs studied cannot be used as media for lipase-catalyzed reaction, especially DESs based on dicarboxylic acids and ethylene glycol as hydrogen-bond donors. Finally, the best DES's specific activity - and stability up to five days incubation time - were analyzed and compared with more conventional organic solvents in various model reactions involving lipases.