

Surfactant-mediated enzymatic superactivity in water/ionic liquid mixtures, evaluated on a model hydrolytic reaction catalyzed by α -chymotrypsin

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In this work, the influence of the C 12 -, C 14 -, and C 16 -alkyl chain derivatives of 1-alkyl-3-methyl-imidazole tetrafluoroborate over the hydrolysis of p-nitrophenyl trimethylacetate catalyzed by α -chymotrypsin was studied in water and water - ionic liquids mixtures. The ionic liquid used is 1-butyl-3-methyl-imidazole tetrafluoroborate (BMIMBF 4). 1-alkyl-3-methylimidazole tetrafluoroborate derived surfactants can increase the catalytic efficiency of α -chymotrypsin on the hydrolysis of p-nitrophenyl trimethylacetate. This effect is negatively affected by the decrease on the surfactant's critical micelle concentration (CMC) and the partition of the substrate between the micelles and the external media observed above the critical micellar concentration (CMC). In water/BMIMBF 4 mixtures, the presence of the ionic liquid (IL), render the C 14 and C 16 surfactants insoluble, and overrides the effect elicited by the C 12 alkyl chain surfactant on the activity of α -chymotrypsin. The loss of the surfactants influence on the enzymatic activity due to the presence of BMIMBF 4 seems to be a complex process, controlled by a decreased affinity between α -chymotrypsin and the surfactant molecules and, to a larger extent, the appearance of an "acquired resistance" of the enzyme to the influence of the surfactants, related to a more compact and resilient conformation of the protein in the presence of BMIMBF 4 . The influence of BMIMBF 4 is not only limited to the surfactant/enzyme interaction, but also it does modifies the partition of the substrate between the aqueous media and the micellar environment.