

Supramolecular strategies in green catalysis: from simple ion pairs to biohybrid catalysts

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Imidazolium salts, mostly known as ionic liquids (ILs) have gained major interest in the world of organic synthesis as promising "green solvents" for they display many interesting characteristics in terms of supramolecular architecture, non-toxicity, atom economy and protein stabilization. Recently, ILs have been used in asymmetric catalysis and biocatalysis, either as solvents or actual catalysts. While catalysis using the cations of ILs has been widely reported in the literature, use of the anions of organic salts as catalysts is still a developing topic in the literature. We present the use of an imidazolium salt bearing a chiral catalytic anion that can be the source of stereo-induction in the aldol and Michael reactions. Demonstrating the beneficial effect of the second coordination sphere provided by the presence of a cyclodextrin in a supramolecular complex, we also present the influence of a host protein on the activity and stereoselectivity of a hybrid system, composed of an imidazolium-based biotinylated anchor and a non-chiral organocatalytic anion (Figure 1). The use of biotinylated-imidazolium salts in combination with racemic or enantiomerically pure catalytic anions allowed us to study the adaptive and cooperative positioning of the anionic catalyst inside the protein. Supramolecular encapsulation of the biotinylated catalyst into avidin results in good selectivity of the reactions performed in ionic liquids: water mixtures.

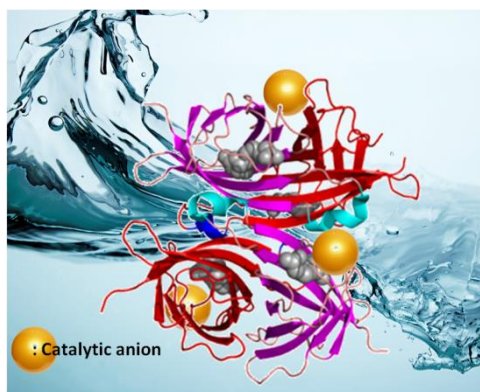


Figure 1. Encapsulation of a catalytic imidazolium salt into avidin

References

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