Development of a hydrolase mimicking peptide amphiphile and its immobilization on silica surface for stereoselective and enhanced catalysis

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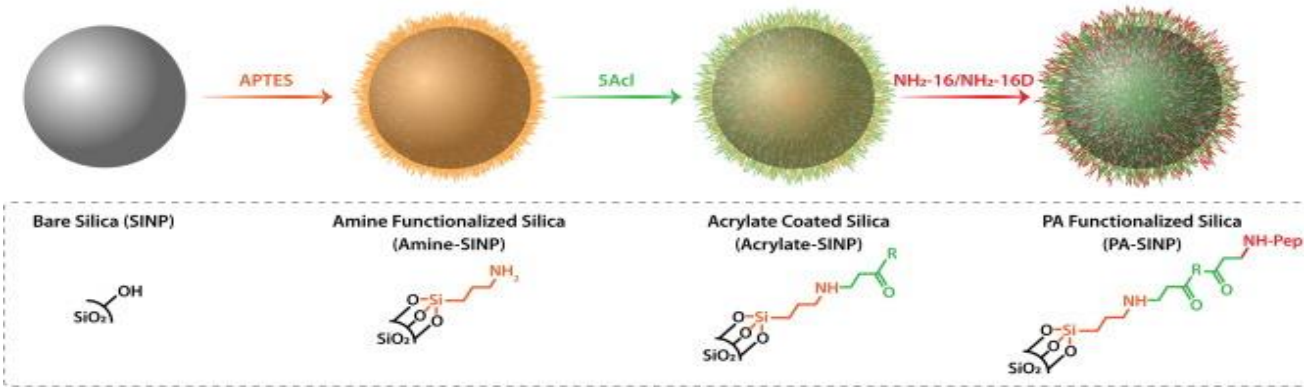
Biocatalysis is an important area of modern research and is extensively explored by various industries to attain greener methods in various applications. Supramolecular interactions of short peptides have been under the scanner for developing artificial smart materials inspired from natural systems. Peptide-based artificial enzymes have been proved to show various enzyme-like activities. Therefore, immobilization of catalytic peptides on solid surfaces can be an extremely useful breakthrough for development of cost effective catalytic formulations. In this work, a series of peptide amphiphiles (PAs) have been systematically analyzed to find the most effective catalyst with esterase like activity. The PA, containing a catalytic triad, 'Asp(Ser)His' in a branched manner, was further immobilized onto silica nanoparticles through covalent bonding method to obtain surface coated catalytic silica nanoparticles. The heterogenous catalytic formulation not only showed enhanced esterase activity than the self-assembled PA in homogenous phase, but also exceeded the activity of natural CV lipase. The catalytic formulation showed high stereoselectivity towards chiral esters. Moreover, the catalyst remained stable at higher temperature, in presence of various denaturant and retained its activity after several catalytic cycles. The ease of separation, robust nature, reusability and high stereoselectivity of the catalyst opens up the possibility of creating new generation heterogeneous catalysts for further industrial applications.



References

1. Development of a hydrolase mimicking peptide amphiphile and its immobilization on silica surface for stereoselective and enhanced catalysis. *Journal of Colloid and Interface Science*,**2022**, *618*, 98–110