

Stimuli-Responsive Hairy Particles for Enzymatic Catalysis in Bulk and at Interfaces

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Enzymes are versatile but highly specific and selective biocatalysts which act under mild conditions. In particular, enzyme-based processes are more environmentally friendly, cost-effective and sustainable than conventional catalytic methods. Therefore, enzymatic catalysis is of great interest for the food and textile industry as well as for pharmaceutical transformations.

The effective immobilization provides an excellent base for enzyme exploitation by enhancing their structural and catalytic stability in different environmental conditions, and reducing product inhibition. However, separation and increasing their reusability still remains a challenging task.

Herein, we report the synthesis and study of stimuli-responsive carrier systems for an efficient immobilization, high catalytic activity and reusability of laccase from *Trametes versicolor*. The series of stimuli-responsive core-shell particles with controlled and tunable chemical functionality, surface charge and grafting density were synthesised using ATRP. [1], [2] A very easy approach for the control of grafting densities between 0.1 and 0.8 nm⁻² and of lengths of polymeric chains was suggested. [2] The hairy core-shell particles were functionalized with the enzyme by physical adsorption. Correlation between the grafting density of the polymer brush shells and the efficiency of immobilisation, as well as the effectiveness of the catalytic performance of laccase was studied in details. [2]

[1] A. Kirillova, C. Schliebe, G. Stoychev, A. Jakob, H. Lang and A. Synytska, *ACS Appl. Mater. Interfaces*, 2015, **7**, 21218.

[2] C. Marschelke, A. Matura and A. Synytska: manuscript under preparation.