

Enzyme aggregate coatings on electrospun nanofibers

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We have developed a unique approach for the fabrication of enzyme aggregate coatings on the surfaces of electrospun polymer nanofibres. This approach employs covalent attachment of seed enzymes onto nanofibres consisting of a mixture of polystyrene and poly(styrene-co-maleic anhydride), followed by a glutaraldehyde (GA) treatment that cross-links additional enzyme molecules and aggregates from the solution onto the covalently attached seed enzyme molecules. These cross-linked enzyme aggregates, covalently attached to the nanofibres via the linkers of seed enzyme molecules, are expected to improve the enzyme activity due to increased enzyme loading and the enzyme stability. In fact, the enzyme activity of enzyme-aggregate-coated nanofibres was much higher than nanofibres with just a layer of covalently attached enzyme molecules and the enzyme stability was also greatly improved with no measurable loss of activity under rigorous shaking conditions. This new approach of enzyme coating on nanofibres, yielding high activity and stability, creates a useful biocatalytic immobilized enzyme system with potential applications in bioconversion and biosensors.