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Nanomaterials for Enzymatic Immobilization

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In recent years nanoparticles and nanoscale materials have generated a great deal of interest from scientists and engineers of nearly all disciplines. This interest has been motivated to a large extent by reports that a number of physical properties including optical and magnetic properties, specific heats, melting points, and surface reactivity are size-dependent. These size-dependent properties are widely believed to be a result of the high ratio of surface to bulk atoms as well as the bridging state they represent between atomic and bulk materials. The interest in biocatalysts for biotechnological applications continues to grow. The fragile nature, high cost, and high loadings required for commercial production limits the use of free enzymes. Enzyme immobilization is utilized to surmount the stability, recovery, and recyclability disadvantages of using enzymes in solution, making them industrially and commercially viable. Nanomaterials are particularly suitable for enzymatic immobilization.

Among nanomaterials, nanofibers represent one of the most attractive nano-device for the production of high added value products. When the diameters of polymer fiber materials are shrunk from micrometers to sub-microns or nanometers there appear several amazing characteristics such as very large surface area to volume ratio flexibility in surface functionalities, and superior mechanical performance (stiffness and tensile strength) compared with any other known form of the material. Membranes of electrospun nylon and polyurethane nanofibers mesoporous silicas or magnetic nanoparticles can be synthesized, functionalized and used for enzymatic immobilization. Different examples will be shown.

Biography:

Rebecca Pogni is Associate Professor of Physical Chemistry. She is a participant in European and national projects and coordinator of the EU project BISCOL “Bioprocessing for sustainable production of coloured textiles”. She is an author of more than 80 papers on international journals on structure-activity relationship studies on enzymatic systems and protein radicals, enzymatic immobilization and synthesis of novel compounds and LCA studies. She is a representative for the University of Siena in the Italian cluster SPRING (Sustainable Processes and Resources for Innovation and National Growth). She is a member of the National Consortium on the Development of Systems with Great Interface (CSGI) and member of the Life Cycle Assessment (LCA) network.