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ADVANCED MATERIALS 2020: Synthesis of fibrous and non-fibrous mesoporous silica magnetic yolk–shell microspheres for immobilization of Lipase-Zafar Ali, Key Laboratory of Applied Physics and Chemistry in Space of Ministry of Education, China

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Abstract

The mesoporous yolk-shell nanoparticles (MYSNs), with a movable Fe3O4 core inside the hollow capsules, with two different morphologies (1)Fe3O4@SiO2@hollow@fibrous SiO2 (Yolk Shell-1) (2)Fe3O4@SiO2@hollow@mesoporousSiO2(Yolk Shell-2) were fabricated as carriers for Candida rugosa lipase (CRL) immobilization, through a template-assistant selectively etching method. Firstly the hydrophobic Fe3O4 nanoparticles were synthesized according to the solvothermal method. Then, SiO2 shell was coated on the Fe3O4 nanoparticle surface by a sol–gel reaction. Subsequently, the resorcinol farmaldehyde (RF) shell was covered on the surface of as-prepared Fe3O4@SiO2 composites and sandwiched Fe3O4@SiO2@RF composites were formed, which were finally provided with mesoporous fibrous (KCC) in the Yolk Shell-1 and mesoporous Silica in the Yolk Shell-2(non fibrous). After selectively etching CTAB and the middle RF layer, the two kinds of yolk/shells composites were obtained. By utilization of their large and open mesopores (20-50nm) with good surface area (457.78-625.54 m2/g,) CRL was immobilized after amino functionalization using glutaraldehyde as a linker. The ICRL on Y.S-1, Y.S-2 showed good loaded (797-501 mg/g) and enzyme activity of (1503-837 U/g) respectively, thermal stability, resistance to pH, recycling and storage capacity were improved as compare to free lipase.

Biography

Dr.Zafar Ali has worked on the immobilization of enzymes. He designed different types of magnetic and nonmagnetic mesoporous composite with different morphologies of nano spheres and microspheres silica materials as carrier for the process of immobilization of lipase. These materials were analyzed for the industrial reactions catalyzed by the lipase. His research work opened new ways for the synthesis of porous materials. The applications of the silica porous materials were expanded. The novel nano/mesoporous material can be utilized in medical and environmental fields of applied sciences.

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