Title: Preparation, Characterization and Application of Fe3O4 Clusters@nSiO2@mSiO2 Nanocomposite Particles for Lipase Immobilization

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Abstract:
Multifunctional Fe₃O₄ clusters/nonporous SiO₂/mesoporous SiO₂ (core/shell/shell) nanocomposite particles were prepared in order to develop a lipase-based recyclable nanobiocatalyst used in the biofuel production. Magnetite nanoparticles were synthesized by coprecipitation method and their clusters were coated by a silica thin shell using the modified Stöber method. Through a template removing approach, a mesoporous silica shell was formed on the nonporous silica. Calcination method in the presence of complex salts was used to expand the pore size of nanoparticles. The obtained nanoparticles possess superparamagnetism, high magnetization, high mean pore diameter (5.82 nm), high surface area (62 m²/g), and large pore volume (781.0 cm³/g). Once nanocomposite particles were prepared, lipase molecules were covalently immobilized onto nanocomposite particles by using glutaraldehyde as an activating agent. Finally, the loading and activity of the immobilized lipase were measured.

Keywords: Immobilization, Lipase, Magnetite Nanoparticles, Nonporous Silica, Porous Silica.

Link to the article: https://www.civilica.com/Paper-ICHEC07-ICHEC07_415.html

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