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(I-CRLMNP): Immobilization of candida rugosa lipase on magnetic nanoparticles with three different surface modifications

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Lipase enzymes are biocatalysts which can catalyze different reactions such as oil hydrolysis, esterification, transesterification, biodiesel production and polymer synthesis. Due to the high cost of enzymes, immobilization offers a promising way for enzyme reusability and improving operational stability. Magnetic nanoparticles are a promising supports for enzyme immobilization due to their ease of preparation and recycling. In this study, Fe3O4 nanoparticle was synthetized and coated with silica to provide a silane group for further reaction with (3-Amino Propyl) Triethoxy Silane (APTS). Afterwards, 3 different coupling agents, i.e., epichlorohydrin, glutaraldehyde, and cyanuric chloride were used for covalent attachment of lipase on magnetic nanoparticles. Various techniques such as SEM, TEM, XRD and FTIR were applied to characterize the MNPs. According to SEM and TEM results, size of magnetic nanoparticles was about 20-30 nm. The results showed that these immobilization processes were successful in terms of enzyme activity and immobilization efficiency. However, glutaraldehyde and cyanuric chloride functionalized magnetic nanobiocatalysts (MNBCs) had a higher activity than epichlorohydrin functionalized ones. This must be due to the side reactions of epichlorohydrin with amino functionalized MNPs which has opened the epoxy group in an improper condition. Further modifications in functionalization process with epichlorohydrin may provide a better support for enzyme immobilization. These MNBCs were used for biodiesel production in further experiments which showed a suitable biocatalyst for this purpose.

Biography

Marzieh Aghababie is a PhD student at University of Isfahan since September 2012. She is working on her PhD thesis entitled "Developing an Enzymatic Nanocomposite Membrane Bioreactor Using Immobilized Lipase on Magnetic Nanoparticle for the Production of Biodiesel". In her Master's, she published three papers in Journal of Food Engineering, Food and Bioproducts Processing Journal and Nutrition and Food Sciences Research. Last year, she had oral presentation about enzymatic nanocomposite membranes in the international conference on membrane science and technology. The present work is a small part of her thesis work.

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