

Magnetic nickel nanostructure as cellulase immobilization surface for the hydrolysis of lignocellulosic biomass

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ABSTRACT

In this research, a magnetic reusable nickel nanoparticle (NiNPs) supporting materials were prepared for cellulase enzyme immobilization. The immobilized cellulase showed high activity recovery, large & fast immobilization capacity and improved pH & temperature tolerance. The excellent stability and reusability enabled the immobilized cellulase to retain 84% of its initial activity after ten cycles. At 2 mg/mL enzyme concentration, highest 93% immobilization efficiency was achieved within two hours of immobilization. When the treatment temperature reached 40 °C and pH 5, the immobilized cellulase exhibited highest residual activity. The immobilized cellulase could be separated from the solution by a magnetic force. This study introduced a novel supporting material for cellulase immobilization, and the immobilized cellulase poses a great potential in the hydrolysis of lignocellulosic biomass which can be used as an easily applicable and sustainable pre-treatment step for advanced biofuel production.

KEYWORDS

Nickel nanoparticles; Amino functionalization; Cellulase immobilization; Enzymatic hydrolysis; Enzyme reusability

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