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Self-assembly of His-tagged amine transaminase with functionalized nanoparticles

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PURPOSE OF THE ABSTRACT

Nanomaterials have great potential as carriers for enzyme immobilization because they provide a very large specific surface area to which enzymes can be bound. Other advantages are good accessibility of the enzyme in the immobilized enzyme preparation and high mechanical strength [1]. The most commonly used nanomaterials for enzyme immobilization are carbon nanotubes, various magnetic nanoparticles, and silica nanoparticles [2].
In this work, the immobilization of His-tagged amine transaminase from the c-LEcta metagenomic library on functionalized silica nanoparticles was investigated. Nanoparticles with diameters of 250 and 500 nm with affinity linkers of different chain lengths containing amine groups were used [3]. Further complexation of cobalt, gadolinium, or iron ions on the surface of the nanoparticles allowed the immobilization of His-tagged enzyme via coordinative bonds. The immobilization yield and the obtained activity were compared, and the self-assembly of the particles and enzymes was inspected by scanning electron microscopy (SEM).
The conversion of (S)-α-methylbenzylamine and sodium pyruvate to acetophenone and L-alanine was chosen as a model reaction for the evaluation of amine transaminase activity [4]. The highest observed immobilization yield of 77% and the highest immobilization efficiency of 44.8% were obtained with 250 nm particles with the longest of the linkers tested. Among the tested metal ions linked to the 250 nm nanoparticles, cobalt resulted in the highest immobilization yield and activity. The self-assembly was also confirmed by SEM.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

amine transaminase | nanoparticles | immobilization | self-assembly

BIBLIOGRAPHY