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Immobilization of clea-lipase of hevea brasiliensis onto magnetic nanoparticles for enhanced biocatalytic performance (Article)

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Abstract

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Skim latex from Hevea brasiliensis consists of many useful proteins and enzymes that can be utilized to produce value-added products for industrial purposes. In this project, to enhance the properties of the recovered lipase from skim latex serum, this enzyme was immobilized via cross-linked enzyme aggregates (CLEA) technology, and supported by magnetic nanoparticles (MNP-CLEA-lipase). MNP-CLEA-lipase was prepared by chemical cross-linking of enzyme aggregates with amino functionalized MNP, which can easily be separated from the spent media after use by magnetic field. The performances of the newly produced MNP-CLEA-lipase were compared with its unsupported counterpart, CLEA-lipase. The optimum conditions for the preparation of CLEA-lipase was carried out by using 45% saturated $(NH_4)_2SO_4$ and 50 mM glutaraldehyde (GA), whereas for MNP-CLEA-lipase, it was carried out by using 70% saturated $(NH_4)_2SO_4$ and 60 mM GA. The optimum pH changes from 6 to 8 when CLEA-lipase is supported, while achieving a maximum of 69.92% residual activity (RA) compared to 20.66% for the unsupported CLEA-lipase. However, the optimum temperature for both are the same (35°C), with MNP-CLEA-lipase achieving 85.89% RA compared to 31.91% for the unsupported ones. Stability studies carried out on both showed that MNP-CLEA-lipase has higher thermal (25–60°C) and pH (5–10) stabilities compared to its unsupported counterparts. As for the reusability of enzymes, MNP-CLEA-lipase retained 56.46% of residual activity after six cycles of reuse. The FESEM results showed that the MNP-CLEA-lipase is a Type 2, which is less structured, and this has bearings towards its activities. FTIR analysis showed the presence of Amide I and Amide II bands in MNP-CLEA-lipase, originating from the newly formed cross-linked between the silanized MNP and CLEA-lipase. Overall, MNP supported CLEA-lipase showed better performance compared to the unsupported biocatalyst.

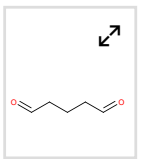
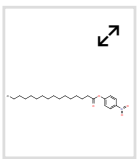
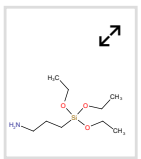
SciVal Topic Prominence

Topic: Immobilized Enzymes | Candida Rugosa | Penicillin Amidase

Prominence percentile: 99.794

Chemistry database information

Substances

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