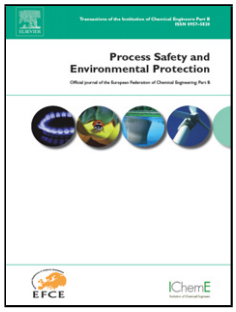

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Preparation of a Novel Multi-walled-carbon-nanotube/Cordierite Composite Support and Its Immobilization Effect on Horseradish Peroxidase

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Highlights

A novel MWCNT/cordierite composite support was designed and successfully prepared.
MWCNTs were loaded on both the surface and inner holes of the cordierite matrix.
The activity of the immobilized HRP increased with the increase of MWCNT content.
The stabilities of the immobilized HRP were far better than those of free HRP.

Abstract

Immobilization of enzyme is important for its application in wastewater treatment and its reuse. A novel multi-walled-carbon-nanotube (MWCNT)/cordierite composite support was designed. MWCNTs were successfully loaded on cordierite matrix with noncovalent self-assembly method through the amination of N-β-aminoethyl-γ-aminopropyl-trimethoxysilane. MWCNTs were loaded on both the surface and the inner holes of the cordierite matrix. Horseradish peroxidase (HRP) was successfully immobilized on the composite support by physical adsorption. The activity of the immobilized HRP increased linearly with the increase of MWCNT content on the composite support because the MWCNTs provided more loading sites. The loading content of HRP on the composite support was as high as 1.34 $mg \cdot g^{-1}$ and its absolute activity reached as high as 1643.2 $U \cdot g^{-1}$, which were much higher than those reached on simple cordierite support. The storage stability, thermo-stability, catalytic stability and acid-base stability of the immobilized HRP were far better than those of free HRP. The immobilized HRP also had good reusability. The good stabilities provided good tolerance under the fluctuant conditions. Such a design and preparation method provided a new route for the design of composite support with ceramics matrix for enzyme catalysts.

Keywords: composite support; cordierite; horseradish peroxidase; immobilization; MWCNTs; self-assembly