Immobilization of Horseradish Peroxidase on Multi-Wall Carbon Nanotubes and Its Electrochemical Properties

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Abstract

Horseradish peroxidase, which catalyzes the oxidation of phenolic compounds to phenolic radicals in the presence of peroxides, has played important roles in the bioelectronic fields including the development of biosensors[1,2] and biofuel cells[3]. In most bioelectronic applications of enzymes, immobilization of enzymes on a suitable solid matrix is essential. Also important is the efficient electron transfer between the immobilized enzymes and the electrodes. In an effort to explore a new type of enzyme electrodes to be used for bioelectronic applications, horseradish peroxidase was immobilized on the carboxylated multi-wall carbon nanotubes. The immobilized horseradish peroxidase maintains activity over broad range of pH values between pH 4 to pH 9. An electrode of graphite rod with a diameter of 6 mm was fabricated using the immobilized horseradish peroxidase. The cyclic voltammetry study of the enzyme electrode shows that the electron transfer occurs between the immobilized horseradish peroxidase and the electrode in the presence of hydrogen peroxide but without an added mediator. These results indicate that the enzyme electrode can be utilized for bioelectronic applications.

References

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