

B09

## Immobilization of HRP in SBA-15 and its application for the construction of polyaniline modified hydrogen peroxide biosensor

Chien-Chung Chen, Jing-Shan Do, Yesong Gu\*

Department of Chemical Engineering, Tunghai University, Taichung, Taiwan, ROC

\*Correspondence e-mail address: [yegu@thu.edu.tw](mailto:yegu@thu.edu.tw)

### Abstract

Polyaniline (PANI), an attractive conductive polymer, has been successfully applied in fabricating various types of enzyme-based biosensors. In this study, we have synthesized mesoporous silicates SBA-15 using nonionic block copolymers and stably entrapped horseradish peroxidase (HRP), and then deposited the loaded SBA-15 (or SBA-15(HRP)) on the PANI modified platinum (Pt) electrode to construct a GA/SBA-15(HRP)/PANI/Pt biosensor for the detection of hydrogen peroxide ( $H_2O_2$ ). The mesoporous structure and morphology of unloaded and loaded SBA-15 were assessed by X-ray diffraction (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM),  $N_2$  adsorption-desorption isotherm, and Brunauer-Emmett-Teller (BET) calculation. Protein assay and ABTS enzymatic assay were employed to evaluate the immobilization efficiency. Our resulted demonstrated that the mesoporous SBA-15 provided large surface area ( $>700 \text{ m}^2/\text{g}$ ) and suitable pore diameter (80~100Å) for HRP immobilization. Meanwhile, the entrapped HRP did not significantly deform the structure of SBA-15, but retained its bioactivity. The cyclic voltammogram (CV) of constructed GA/SBA-15(HRP)/PANI/Pt biosensor also displayed a fine linear correlation between cathodic response and  $H_2O_2$  in the range of 0.02 to 40 mM ( $R^2 = 0.999$ ) with enhanced sensitivity ( $87.96 \mu\text{A}\cdot\text{mM}^{-1}\cdot\text{cm}^{-2}$ ). In particular, this approach by utilizing SBA-15 to entrap HRP allowed the PANI modified biosensor to be performed with multiple measurements as the result of improved stability.

Keywords: Polyaniline; SBA-15; horseradish peroxidase; hydrogen peroxide; biosensor