

Application of Tyr-latex particles adsorbed on Cylindrical CFEs as phenols biosensor

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A novel bioelectrode-based on adsorption of Tyr-latex particles on a single cylindrical carbon fiber electrode (CFE) with and without electrochemical pretreatment (strong and weak), as shown in Fig. 1, to determine catechol substrate was done. The tyrosinase-coated latex particles were composed of the core polystyrene and four successively coating layers: the polystyrene sulfonate, the polyallylamine, the tyrosinase and the polyallylamine, by the layer-by-layer technique¹.

The electrochemical pretreatments of electrodes have effect to the adsorption/desorption of Tyr-latexes and also catalytic response of electrodes to oxidize σ -quinone to catechol. Cyclic voltammetry (CV) of catechol at Tyr-latex particles adsorbed on CFEs with and without pretreatment was shown in Fig. 2. As anodization forms surface oxides layer preferentially adsorbs cation at the outermost layer of Tyr-latex particle, so leads to enhanced sensitivity of the enzymatic electrocatalytic reaction of Tyr-latexes-CFE.

Fig. 3 shows variations of the steady-state current with concentrations of catechol, c_c , at Tyr-latexes-CFE with and without pretreatment (strong and weak). The current increased in proportion to c_c and saturated at high concentrations. The relation between the catalytic current and the concentration of catechol followed the kinetic equation predicted from Michaelis-Menten relation. K_M^{app} of Tyr-latex particles adsorbed on strongly pretreated < weakly pretreated < untreated CFEs for catechol measurement.

The response and stability was improved by increasing amount of Tyr-latex particles on sCFE using layer-by-layer technique. K_M^{app} of 2 layers Tyr-latexes-wCFE on phenol and catechol were 174.25 and 45.7 μ M.

Reference

1) Rijiravanich, P., Aoki, K., Chen, J., Surareungchai, W. and Somasundram, M., *Electroanalysis*, 2004, 16, 605-611.

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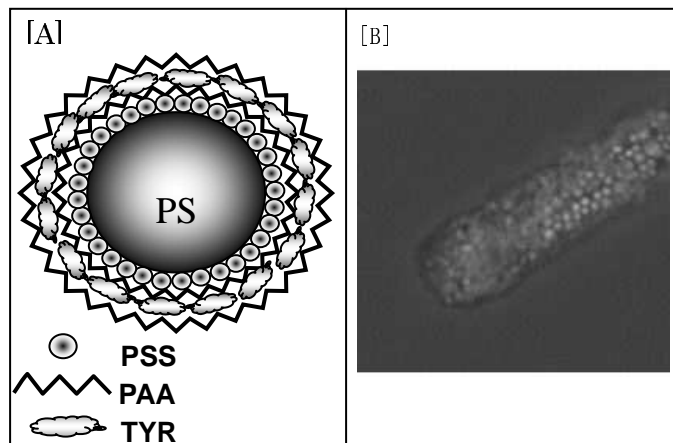


Fig.1 [A] Illustrative layer-by-layer structure of the TRY-coated polystyrene latex particle. The core is the polystyrene latex, the surface of which is coated with polystyrene sulfonate (PSS), polyallylamine (PAA), tyrosinase and PAA, successively¹. [B] Tyr-latex adsorbed on CFE.

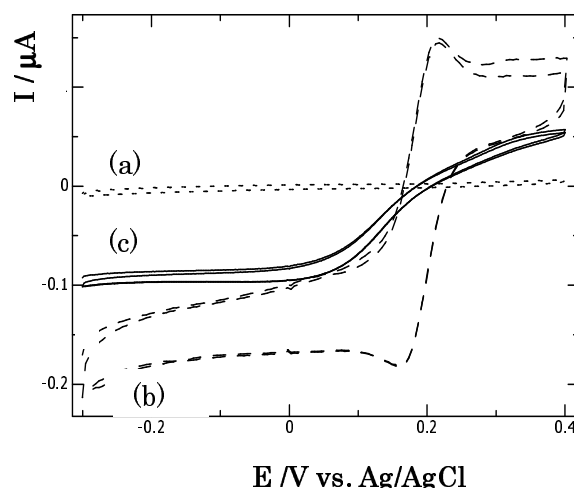


Fig.2 Comparison of CV of 0.45 mM catechol at Tyr-latex particles adsorbed on (a) untreated, (b) weakly pretreated and (c) strongly pretreated CFEs at potential sweep rate 50 mV s^{-1} . Air-saturated phosphate buffer solution pH 6.8.

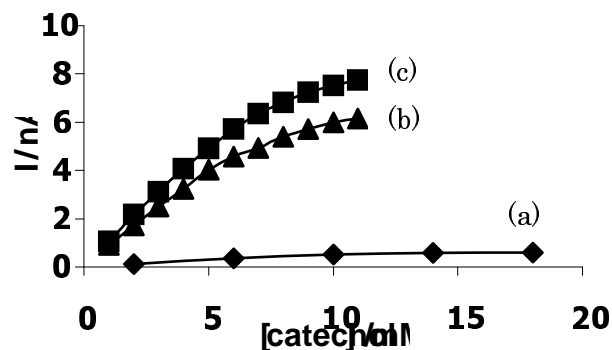


Fig.3 Calibration curves of TYR-latexes-CFEs at (a) untreated, (b) weakly and (c) strongly pretreatment to successive addition of catechol to 0.1 M phosphate buffer, pH 7, containing 0.1 M KCl at -100mV .