Effects of counter-ions on the electropolymerization behaviors and properties of polyaniline

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Conductive polymer of polyaniline (PANI) was prepared by potentiostatic electropolymerization technique onto Au at 25°C in a series of solutions containing NO_3^- , SO_4^{2-} , Cl^- , ClO_4^- and PO_4^{3-} , respectively. The effects of different counter-ions on the electropolymerization behaviors and capacitive behaviors of PANI films were investigated by cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) electrochemical measurements. As a result, the difficulty of electropolymerization of aniline in electrolytes containing different kinds of counter-ions from high to low is in the order: $\text{NO}_3^- > \text{SO}_4^{2-} > \text{ClO}_4^- > \text{Cl}^- > \text{PO}_4^{3-}$, while the rate of electropolymerization of aniline in electrolytes containing different kinds of counter-ions from high to low is in the order: $\text{SO}_4^{2-} > \text{NO}_3^- > \text{Cl}^- > \text{ClO}_4^- > \text{PO}_4^{3-}$. The order of the conductivity of pAn films obtained in solutions containing different counter-ions from high to low is: PANI/ $\text{HNO}_3 > \text{PANI}/\text{H}_2\text{SO}_4 > \text{PANI}/\text{HCl} > \text{PANI}/\text{HClO}_4 > \text{PANI}/\text{H}_3\text{PO}_4$. The order of the charge storage ability of PANI obtained in different solutions from high to low is: PANI/ $\text{H}_2\text{SO}_4 > \text{PANI}/\text{HNO}_3 > \text{PANI}/\text{HCl} > \text{PANI}/\text{HClO}_4 > \text{PANI}/\text{H}_3\text{PO}_4$.

Keywords: polyaniline; electropolymerization; counter-ions; EIS; capacitive behaviors.

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