

Electro-oxidation of Catechol in the Presence of Nicotinamide at Different pH

Authors : M. A. Motin, M. A. Aziz, M. Hafiz Mia, M. A. Hasem

Abstract : The redox behavior of catechol in the presence of nicotinamide as nucleophiles has been studied in aqueous solution with various pH values and different concentration of nicotinamide using cyclic voltammetry and differential pulse voltammetry. Cyclic voltammetry of catechol in buffer solution ($3.00 < \text{pH} < 9.00$) shows one anodic and corresponding cathodic peak which relates to the transformation of catechol to corresponding o-benzoquinone and vice versa within a quasi reversible two electron transfer process. Cyclic voltammogram of catechol in the presence of nicotinamide in buffer solution of pH 7, show one anodic peak in the first cycle of potential and on the reverse scan the corresponding cathodic peak slowly decreases and new peak is observed at less positive potential. In the second cycle of potential a new anodic peak is observed at less positive potential. This indicates that nicotinamide attached with catechol and formed adduct after first cycle of oxidation. The effect of pH of catechol in presence of nicotinamide was studied by varying pH from 3 to 11. The substitution reaction of catechol with nicotinamide is facilitated at pH 7. In buffer solution of higher pH (>9), the CV shows different pattern. The effect of concentration of nicotinamide was studied by 2mM to 100 mM. The maximum substitution reaction has been found for 50 mM of nicotinamide and of pH 7. The proportionality of the first scan anodic and cathodic peak currents with square root of scan rate suggests that the peak current of the species at each redox reaction is controlled by diffusion process. The current functions ($1/v-1/2$) of the anodic peak decreased with the increasing of scan rate demonstrated that the behavior of the substitution reaction is of ECE type.

Keywords : redox interaction, catechol, nicotinamide, substitution reaction, pH effect

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