Preparation of the Palladium/Polymeric Pyrrole-Multi-Walled Carbon Nanotubes Film/Titanium Electrode and Its Performance for the Dechlorination of 4-chlorophenol

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The electrochemically reductive dechlorination of 4-chlorophenol (4-CP) in aqueous solution on a palladium/polymeric pyrrole-multi-walled carbon nanotube film/meshed titanium electrode (Pd/PPy-MWCNTs/Ti) was examined in this paper. The Pd/PPy-MWCNTs/Ti cathode was prepared through electrodepositing cauliflower-like palladium nanoparticles onto a PPy-MWCNTs/Ti electrode (that was a titanium electrode coated with pyrrole and functionalized multi-walled carbon nanotubes by co-deposition). The physical properties of this electrode were characterized by scanning electron microscope (SEM) and X-ray diffraction (XRD). Various factors influencing the dechlorination of 4-CP were also investigated. The results indicated that the removal rate of 4-CP reached 99.82% within 120 min and the current efficiency of 13.8% was obtained under the optimum conditions (the dechlorination density of 1.0 mA/cm², the initial pH of 2.08 and the electrolyte of 0.1 mol/L Na₂SO₄). The predominant product was phenol. In addition, the electrode was found to be still stable after being used for six cycles and the dechlorination efficiency was over 93.3%.

Keywords: Polymeric pyrrole, Multi-walled carbon nanotubes, Palladium, Dechlorination, 4-chlorophenol

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