Electrochemically reductive dechlorination of 2,4,6-trichlorophenol on palladium loaded titanium cathode modified with graphene/polymeric pyrrole-sodium dodecyl benzene sulfonate

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ABSTRACT

Graphene (Gr)/polymeric pyrrole-sodium dodecyl benzene sulfonate (PPy-SDBS) were used to modify the palladium loaded titanium electrode. The palladium/graphene/polymeric pyrrole-sodium dodecyl benzene sulfonate/titanium (Pd/Gr/PPy-SDBS/Ti) electrode was successfully prepared by the simple drop-casting/electrodeposition process. The Pd/Gr/PPy-SDBS/Ti electrode showed high electrochemical activity in the application of the electrochemically reductive dechlorination of 2,4,6-trichlorophenol (2,4,6-TCP) in aqueous solution. The influence factors of dechlorination including dechlorination current and initial pH value were studied and the optimum dechlorination current and initial pH value within the investigated range were 5 mA and 2.3, respectively. Under these conditions, 100 mg L⁻¹ 2,4,6-TCP could be removed and dechlorinated completely within 80 min, and the current efficiency could reach 36%. The main final product of 2,4,6-TCP was phenol and the dechlorination pathways were studied according to the intermediate products detected by HPLC. The dechlorination reaction of 2,4,6-TCP fitted well to the pseudo-first-order kinetics. The effect of temperature on 2,4,6-TCP dechlorination and the stability of the prepared electrode were also investigated.

Keywords: Palladium/graphene/polymeric pyrrole-sodium dodecyl benzene sulfonate/titanium electrode; Graphene; 2,4,6-trichlorophenol; Electrochemically reductive dechlorination