Electrocatalytic dechlorination of p-chlorophenol using a 3D cathode with magnetic separable Fe₃O₄@PPy@Pd catalyst

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The magnetic separable catalyst, Fe₃O₄@PPy@Pd, was successfully prepared and characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), and inductively coupled plasma-atomic emission spectroscopy (ICP-AES). The three dimensional (3D) composite electrode was fabricated by loading the Fe₃O₄@PPY@Pd catalyst onto a permanent magnet core@Ti housing support. The electrocatalytic hydrodechlorination of p-chlorophenol on the 3D composite electrode in aqueous solutions was investigated, and the influences of initial pH, the applied current and the type of aeration on the dechlorination efficiencies of p-chlorophenol were also studied. The dechlorination efficiency reached 92.3% within 120 min, under optimum conditions, i.e., with a dechlorination current of 5 mA, a pH value of 2.35 and using a supporting electrolyte of 0.05 mol/L Na₂SO₄ at ambient temperature. The 3D composite electrode shows promising potential for dechlorination with good stability and reusability.

Keywords: electrocatalytic dechlorination; three-dimensional electrode; polypyrrole; magnetic separable catalysts

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