

Study on Performance of Electrocatalytic Dechlorination of 2, 5-dichloronitrobenzene by Copper and Palladium Bimetallic Composites Modified Ti Electrode in Aqueous Solution

He Xu^{1,*}, Aili Li¹, Zhongyi Gu², Jianshe Liu¹, Jinli Qiao¹

¹ College of Environmental Science and Engineering, Donghua University, Shanghai 201620, PR China

² Technical Center for Industrial Product and Raw Material Inspection and Testing of Shanghai Customs, Shanghai, 200002, PR China

*E-mail: hexu@dhu.edu.cn

doi: 10.20964/2020.12.59

Received: 14 August 2020 / Accepted: 23 September 2020 / Published: 31 October 2020

In our work, a facile copper and palladium composites modified Ti electrode (Cu-Pd/Ti) was prepared by electrochemical deposition and chemical replacement method, which was applied for electrocatalytic dechlorination of 2, 5-Dichloronitrobenzene (2, 5-DCNB), a typical organic chloride pollutant. The morphologies and structures of Cu-Pd/Ti were characterized by scanning electron microscopy (SEM), X-ray diffraction (XRD), and X-ray photoelectron spectroscopy (XPS). The electrochemical performance was examined by cyclic voltammetry (CV) and linear sweep voltammetry (LSV). The experimental results displayed that Cu polyhedrons were formed at the Ti electrode surface (Cu/Ti) and the palladium metals were mainly coated at Cu/Ti electrode in the zero-valent and divalent states. Meanwhile, the copper-palladium composites were uniformly dispersed at the Ti electrode surface. The electrochemical experiments verified that Cu-Pd/Ti composite electrode exhibited high catalytic dechlorination property and large electrochemical active surface area (EASA) owing to the cooperative interaction of Cu and Pd composites materials. The Cu-Pd/Ti displayed better electrocatalytic efficiency towards 2, 5-DCNB reduction than that of the other electrodes in this experiment. With a current density of 2.25 mA/cm², the electro-reductive removal rate of 2-DCNB reached 97.1% within 3 hours. The intermediates and mechanisms of dechlorination were identified through high-performance liquid chromatography (HPLC) and gas chromatography coupled with mass spectrometry (GC-MS), and the main final products were properly transformed to aniline. This work may provide a beneficial choice for the effective treatment of DCNBs in the environment.

Keywords: Electrocatalytic dechlorination, Electrochemical degradation, Chloro-nitrobenzene compounds, Cu-Pd bimetallic composites

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).