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Pd/C气体扩散电极用于电化学降解4-氯酚的研究

Electrochemical degradation of 4-chlorophenol using a Pd/C gas diffusion electrode

关键词: [电化学氧化](#) [气体扩散电极](#) [Pd/C催化剂](#) [氯酚类污染物](#)

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摘要: 采用氢气还原法制备Pd/C催化剂,利用XRD、TEM及XPS对该催化剂进行了表征,并利用此催化剂制备成新型的Pd/C气体扩散阴极;在隔膜电解体系中对4-氯酚进行降解,比较了不同通气方式下的去除效果.结果表明,所制备的催化剂中Pd以无定形态存在并高度分散在活性炭表面,形状比较规则,粒径在4.1nm左右;制备的0.5%Pd/C催化剂表面的Pd摩尔分数达到1.29%;制备的Pd/C气体扩散阴极既对4-氯酚具有还原脱氯作用(通入H₂时),又促进O₂还原生成H₂O₂(通入O₂时).采用先通氢气后通空气的方式对4-氯酚有很好的去除效果,反应60min后4-氯酚的转化率和脱氯率接近100%,120min后阴极室COD去除率达到87.4%.因此,采用Pd/C气体扩散阴极可通过还原、氧化相结合的方法对氯酚类有机物进行降解.

Abstract: A Pd/C catalyst for the Pd/C gas diffusion electrode was prepared by hydrogen reduction and characterized by XRD, TEM, and XPS. Using the Pd/C gas diffusion electrode as the cathode, electrochemical degradation of 4-chlorophenol wastewater was investigated in a diaphragm electrolysis system with three different feeding gas modes. The results indicate that amorphous Pd particles with an average size around 4.1 nm were highly dispersed in the activated carbon, and the Pd content on the surface of the Pd/C catalyst reached 1.29%. Furthermore, feeding first with hydrogen gas then with air, improved the 4-chlorophenol removal efficiency. The home-made Pd/C gas diffusion cathode not only reductively dechlorinated 4-chlorophenols when bubbled with hydrogen, but also accelerated the two-electron reduction of O₂ to H₂O₂ when aerated with air. So both the removal efficiency and the degree of dechlorination for 4-chlorophenol wastewater reached about 100% after 60 min, and the average removal efficiency of wastewater in terms of COD exceeded 70% after 120 min. Therefore, it is feasible to degrade chlorinated phenol contaminants by electrochemical reduction to phenol, which was further degraded on the cathode and anode by electrochemical oxidation in the diaphragm electrolysis system.

Key words: [electrochemical oxidation](#) [gas diffusion electrode](#) [Pd/C catalyst](#) [chlorophenol pollutant](#)

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