The Application of an Activated Carbon Supported Cu-Ce/Ac Oxide Anode on the Electrocatalytic Degradation of Phenol

Jun-e Qu^{1,2}, Shu Zhou², Hairen Wang^{1,2,*}, Zhiyong Cao^{1,2}, Hongfang Liu³

¹ Faculty of Materials Science and Engineering, Hubei University, WuHan, 430062, PR China

² Ministry-of-Education Key Laboratory of Green Preparation and Application for Functional Materials, Faculty of Materials Science & Engineering, Hubei University, Wuhan, 430062, China

³ Department of Chemistry, HuaZhong University of Science and Technology, Wuhan 430074, Hubei, China

*E-mail: whr9999whr@163.com

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The Cu-AC (AC: activated carbon) and Cu/Ce-AC composite materials were synthesized using a one-pot sol-gel method. The surface microstructure and composition of the resulting samples were characterized by Brunauer–Emmett–Teller (BET) specific surface area analysis, scanning electron microscopy/energy dispersive x-ray (SEM/EDX), and XPS (X-ray photoelectron spectroscopy) compared to pure AC. Finally, the electrochemical catalytic activity of the prepared materials for the oxidative degradation of phenol were contrastively studied. It was found that the Cu/Ce-AC catalyst had larger surface area, greater pH_{PZC} value (pH value at the point of zero charge), stronger ability to chemisorb active oxygen, and more possible forms of higher oxides generated from chemisorbed hydroxyl radicals, than AC and Cu/AC. These factors synthetically resulted in its more prominence electro catalytic activity for phenol degradation compared to AC and Cu/AC. The 50min continuous electrochemical degradation for phenol by using Cu/Ce-AC achieved over 97% COD and 80% TOC removals at initiate phenol concentration = 504 mg/L, temperature = 25°C, pH = 3.0 and $j = 80 \text{ A} \cdot \text{m}^{-2}$. The considerable electro catalytic performance of Cu-Ce/AC material makes it a promising anode for electrochemical treatment of organic pollutants in aqueous solution.

Keywords: phenol, sol-gel method, electrochemical degradation, Cu-Ce/AC anode

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