Cu-Au/rGO Nanoparticle Based Electrochemical Sensor for 4-Chlorophenol Detection

Yajing Yang, Ning Ma, Zhaoyong Bian*

College of Water Sciences, Beijing Normal University, Beijing 100875, PR China

*E-mail: bian@bnu.edu.cn

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Copper, gold or gold/copper nanoparticles loaded on reduced graphene oxide (Cu/rGO, Au/rGO and Cu-Au/rGO) were synthesized as catalysts, using chemical and fractional reduction processes. These materials were characterized by scanning electron microscopy, X-ray diffraction, transmission electron microscopy, Fourier transform infrared spectroscopy and X-ray photoelectron spectroscopy. A series of sensitive 4-chlorophenol (4-CP) sensors were fabricated using electrodes modified with these three catalysts. The impedance values of these devices were assessed using an alternating current impedance method, while the detection of 4-CP was investigated by cyclic voltammetry. The Cu-Au/rGO exhibited the best catalytic properties. Under optimized conditions (pH 6.5, scan rate 100 mV/s), a sensor based on a glassy carbon electrode modified with this material exhibited a low 4-CP detection limit of 0.17 $\mu\text{mol/L}$, and demonstrated good reproducibility and long-term stability. This sensor has high application value in on-line detection of chlorophenol pollutants in wastewater.

Keywords: Cu-Au/graphene; glassy carbon electrode; 4-chlorophenol wastewater; electrochemical detection

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