水質分析

Pyrolysis of zeolitic imidazolate framework and graphene oxide as Zn/N-enriched carbon nano-cubes for electrochemical sensing of paracetamol

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Abstract

Zeolitic imidazolate frameworks and graphene oxide (ZIF-GO) derived 3D-2D Zn/N-enriched carbon nano-cubes (Zn/N/rGO/CNC) was developed for the electrochemical detection of the analgesic paracetamol (PCT). The pyrolysis of ZIF-GO led to the formation of a nanoscale structure featuring Zn/N carbon cubes embedded in rGO sheets. The Zn^0-to-ZnO phase transition was found to mediate electrons during the reversible paracetamol redox reactions, which contributed to the sensing current response. Upon 800 ^oC heating under a N_2 atmosphere, the mesoporosity of Zn/N/rGO/CNC(800) was significantly enhanced, thereby increasing the electrochemical surface area and charge transfer efficiency. The electrode sensitivity was optimized at a calibration linearity of 0.526 $\mu A\ \mu M^{-1}$) with detection limit (0.077 μM) in the range of 0.5 – 70 μM using differential pulse voltammetry mode (DPV). The precision of analytical recovery for trace paracetamol concentrations was maintained based on the excellent reproducibility and selectivity trials in the presence of interference chemicals and in real water samples.

Keywords: Metal organic framework; Reduced graphene oxide; Operando Raman spectra; Mesoporosity; 3D-2D composite carbon