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Melamine-derived Carbon Electrode for Efficient H_2O_2 Electro-generation

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Abstract: A facile one-step fabrication of a highly porous nitrogen-enriched graphitic carbon (NGC) cathode derived from melamine was proposed. It was the very first time for the NGC cathode to be used in the electro-Fenton (EF) process for evaluating electro-generated H_2O_2. The surface characteristics of melamine carbonized at different temperature (NGC-800, NGC-850 and NGC-900) were systematically investigated, including the microstructure, composition, electrochemical properties by the methods of scanning electron microscopy (SEM), X-ray diffraction (XRD)，X-ray photoelectron spectroscopy (XPS), Cyclic voltammetry (CV) and Electrochemical impedance spectroscopy (EIS). Results showed that NGC samples carbonized at different temperature were highly porous with a micrometer size of skeletons (1.5-2.2 μm). Considering the H_2O_2 ability, NGC-900 was most efficient cathode in electro-generated H_2O_2 with a H_2O_2 concentration of 87.19 μmol/L (add H_2O_2 concentration) among NGC-800, NGC-850 and NGC-900. Moreover, the high efficient H_2O_2 generation ability kept stable in a wide pH range from 3 to 9. Combined the technologies, including XPS and electrochemical technologies CV, the high efficient H_2O_2 capacity attributed to the pyrrolic N structure, together with the improved electroconductivity. Therefore, the simple fabrication approach for melamine-derived carbon cathode is a promising low-cost cathode for EF.

Keywords: Nitrogen-carbon material, Pyrrolic N, Hydrogen peroxide, Electro-Fenton,