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Electrochemical Sensor for Melamine Based on Its Copper Complex

Hong Zhu, Songxin Zhang, Meixian Li, Yuanhua Shao and Zhiwei Zhu*

Institute of Analytical Chemistry, College of Chemistry and Molecular Engineering, Peking University, Beijing 100871, PR China

Experimental

1. Materials

Melamine was purchased from Sigma-Aldrich. Cupric chloride was purchased from Beijing Yili Fine Chemicals Company. The MWCNTs with mean diameter of about 30 nm were obtained from Tsinghua University of China as gifts. They were produced by catalytic chemical vapor deposition (CCVD) method. Triply distilled water was used to prepare all solutions. High purity nitrogen was used for deaeration. All other chemicals were analytical grade and were used as received from commercial sources. Liquid milk was purchased from local supermarkets.

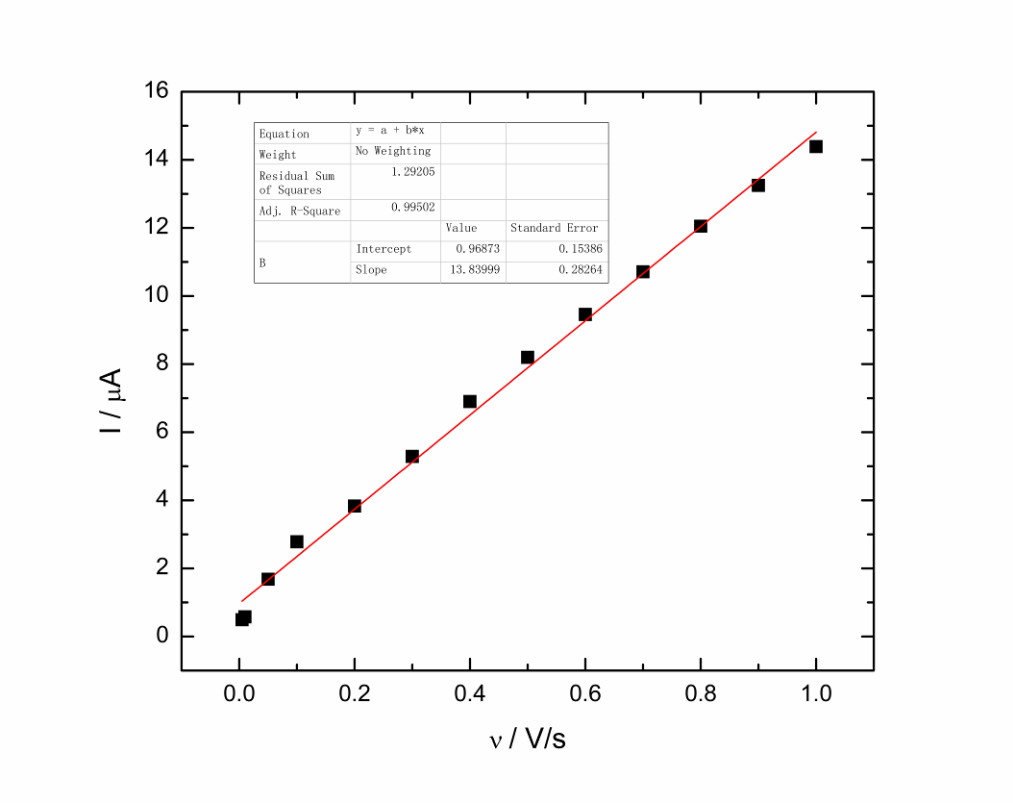
2. Apparatus

Electrochemical measurements were performed with a CHI 660C electrochemical workstation (Shanghai, China). A standard three-electrode electrochemical cell was used. The electrode assembly consists of a bare or a MWCNTs-modified glassy carbon electrode (GCE) with a diameter of 3 mm as the working electrode, a platinum wire as the counter electrode and Ag/AgCl (3 M KCl) as the reference electrode. The potential in all figures are indicated relative to this reference electrode. All solutions were deaerated with high purity nitrogen before electrochemical measurements, and nitrogen was passed over the top of the solution during the experiments. The ultraviolet-visible spectrum (UV-Vis) was obtained by U-4100 (Hitachi, Japan). The infrared spectrum (IR) was recorded on a VECTOR22 (Bruker, Germany). The electrospray ionization mass spectrum (ESI-MS) was recorded on a LCQ Advantage MAX ion trap mass spectrometer (Thermo Finnigan, USA). All measurements were conducted at room temperature (25±2℃).

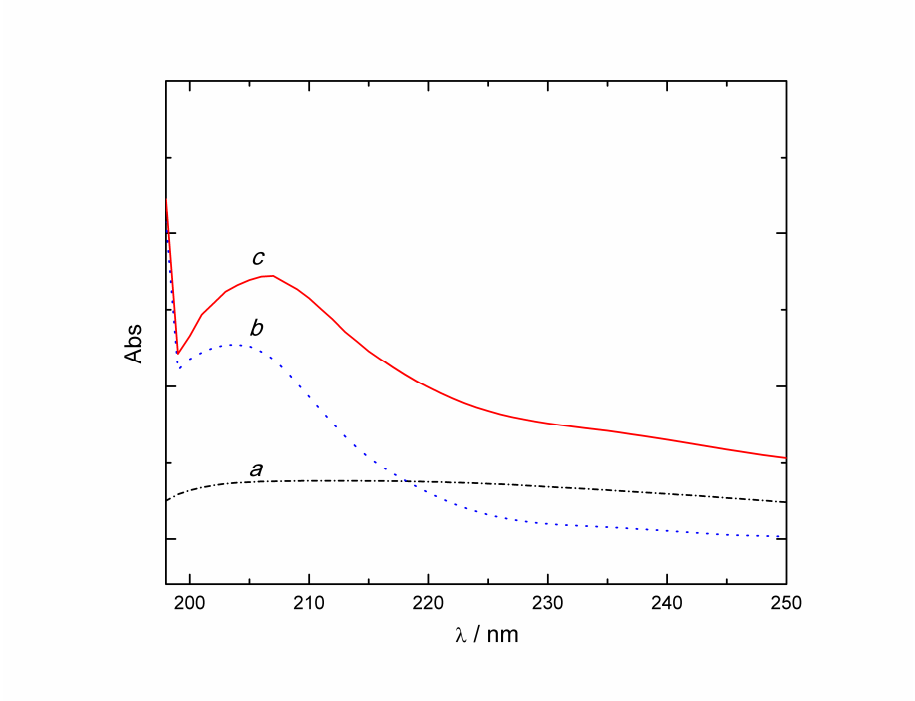
3. Fabrication of Electrochemical Sensor

2.8 mg of carboxylated MWCNTs were dispersed in 1.0 ml of dimethylfomamide (DMF). Prior to use, a GCE with a diameter of 3 mm was polished with 0.05 μm alumina slurry, and then washed ultrasonically in distilled water and ethanol for a few minutes, respectively. After that, the well-polished GCE was coated by casting 1.0 μL of the dispersed MWCNTs solution, and dried under an infrared lamp.

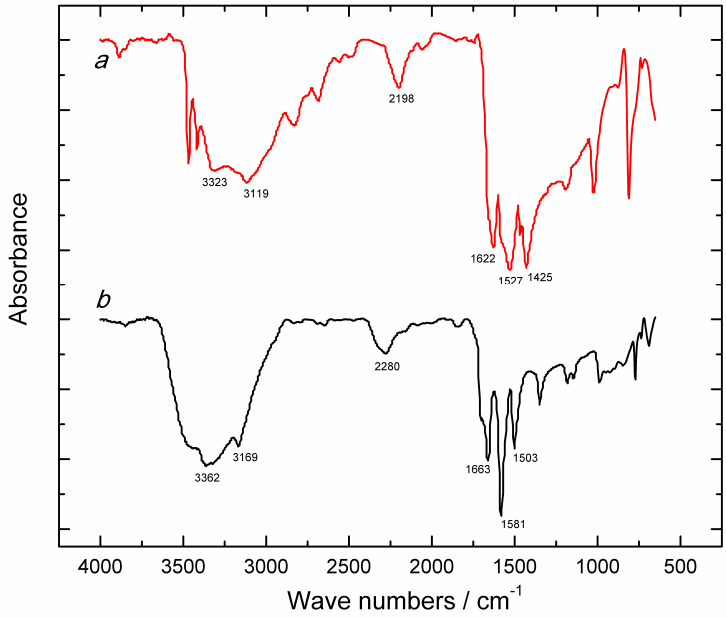
* Corresponding author. Tel.: +86 10 62757953; fax: +86 25 62751708.
E-mail address: zwzhu@pku.edu.cn (Z. Zhu).



The relationship between the oxidation peak current and scan rate. The concentration of Mel is 40 nM. Other conditions as in Fig.2.



UV-Vis spectrum for 200 μM $CuCl_2$ (a) or 40 μM Mel (b) or 200 μM $CuCl_2$ + 40 μM Mel (c). Other conditions as in Fig.2.



IR spectrum for 40 μM Mel (a) or 200 μM $CuCl_2$ + 40 μM Mel (b). Other conditions as in Fig.2.