

Electrochemical reduced graphene oxide-poly(eriochrome black T)/gold nanoparticles modified glassy carbon electrode for simultaneous determination of ascorbic acid, dopamine and uric acid

ABSTRACT

This work reports on the preparation of electrochemically reduced graphene oxide (ERGO)-poly(eriochrome black T) (pEBT) assembled gold nanoparticles for the simultaneous determination of ascorbic acid (AA), dopamine (DA) and uric acid (UA) in PBS pH 6.0. Characterisations of the composite were carried out by scanning electron microscopy (SEM), Fourier transform infrared (FTIR), electrochemical impedance spectroscopy (EIS) and cyclic voltammetry. As a result of the synergistic effect, the modified glassy carbon electrode (GCE) possessed an efficient electrochemical catalytic activity with a high selectivity and sensitivity in oxidising AA-DA and DA-UA as compared to the bare GCE. The peak separations of AA and DA, DA and UA were 183 mV and 150 mV, respectively. The linear response ranges for AA, DA and UA were 10–900 μM , 0.5–20 μM and 2–70 μM with detection limits of 0.53 μM , 0.009 μM and 0.046 μM ($S/N = 3$), respectively. The sensitivity of ERGO-pEBT/AuNPs was measured as 0.003 $\mu\text{A}/\mu\text{M}$, 0.164 $\mu\text{A}/\mu\text{M}$ and 0.034 $\mu\text{A}/\mu\text{M}$ for AA, DA, and UA, respectively. The modified electrochemical sensor was used in the determination of AA, DA, and UA in vitamin C tablets and urine sample with good recovery.

Keywords: Reduced graphene oxide; Eriochrome black T; Gold nanoparticles; Simultaneous detection