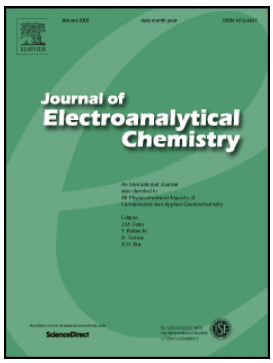

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Alumina/graphene/Cu hybrids as highly selective sensor for simultaneous determination of Epinephrine, Acetaminophen and Tryptophan in Human Urine

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Abstract

A highly selective electrochemical sensor representing alumina/graphene/Cu hybrid structure was fabricated by electrodeposition of copper nanoparticles on graphene encapsulated alumina nanofibers and was employed for the simultaneous determination of epinephrine (EP), Acetaminophen (AP) and L-Tryptophan (Trp) with low instrumental detection limits (LOD) and wide linear ranges. Cyclic voltammetry, electrochemical impedance spectroscopy, differential pulse voltammetry and chronoamperometry methods were used to study electrochemical properties of the developed electrode. Well-separated oxidation peaks and enhanced peak currents of EP, AP, and Trp were observed owing to the superior conductivity of highly foliated multi-layered graphene and the excellent catalytic activity of Cu nanoparticles. Specifically, the separation of anodic peak potentials for EP-AP, AP-Trp and EP-Trp were 160, 274 and 434 mV *vs*. SCE, respectively. The peak currents linearly depended on EP, AP and Trp concentrations in the range of 1–1200, 1–700 and 1–1000 µM with LOD of 0.027, 0.012 and 0.009 µM, respectively ($S_{bk}/m = 3$). The chemically modified electrode was successfully challenged with some interfering compounds and was evaluated in human urine sample for determination of EP, AP and Trp demonstrating outstanding stability and repeatability. Fabricated sensor is an appropriate candidate for the pharmaceutical applications and clinical investigations.