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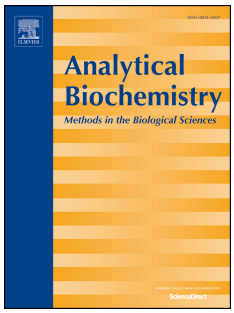

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An electrochemical sensor based on cellulose nanocrystal for the enantioselective discrimination of chiral amino acids

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Abstract

A novel electrochemical sensor based on 2,2,6,6-tetramethylpiperidine-1-oxyl (TEMPO)-oxidized cellulose nanocrystals (TOCNC) and L-cystines (L-Cys) modified Au electrode (TOCNC/L-Cys/Au) has been fabricated for detection and discrimination of the enantiomers of phenylalanine (Phe), leucine (Leu) and valine (Val).The three amino acids are in connection with metabolism diseases. The TOCNC/L-Cys/Au electrode exhibited obvious peak current difference for the amino acids enantiomers by cyclic voltammetry (CV) and differential pulse voltammetry (DPV). The TOCNC on the electrode surface have expressed different interaction with D and L- amino acids, so the electrochemical recognitions of the three amino acids enantiomers have been achieved. TOCNC have been characterized by Fourier transform infrared (FT-IR) and scanning electron microscopy (SEM). The modified electrodes were characterized by SEM and electrochemical techniques. According to the DPV, peak currents of the two enantiomers decreased linearly with their concentrations. Furthermore, satisfactory results were obtained when this electrode was applied to measure the D- and L-Phe mixture. The experiments results show that TOCNC are suitable material for chiral sensor. The contrast of serum sample of healthy people and patients with type 2 diabetes also had been proposed and significant difference has been exhibited on the modified electrode. The work is significant for the screening, diagnosis and treatment of multiple metabolic diseases.

Key words: Cellulose nanocrystals, electrochemical sensor, chiral amino acids, enantioselective discrimination