Two-electrode Sensor System for Rapid Detection of Sulfonamides by Applying the Nafion-Carboxyl Multiwalled Carbon Nanotubes Powder Microelectrode

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A powder microelectrode (PME), embedded with Nafion-carboxyl multiwalled carbon nanotubes (MWCNTs), was prepared for selective and sensitive determination of sulfonamides. The effects of experimental parameters on the response of electrode such as pH of buffer, scan rate were optimized. Under optimal conditions, the proposed PME can greatly improve the determination sensitivity. In a Britton-Robison (BR) buffer solution (pH 2.0), the linear response range for detection of 1.0×10^{-5} mol/L to 1.0×10^{-4} mol/L of sulfonamide ($R^2=0.984$), sulfadiazine ($R^2=0.993$), sulfamethazine ($R^2=0.987$), sulfamethoxazole ($R^2=0.982$) and the detection limits of 2.69×10^{-6} mol/L, 3.10×10^{-6} mol/L, 8.94×10^{-6} mol/L and 5.79×10^{-6} mol/L, respectively. The recoveries were in the range of 87~106% with $RSD < 5\%$ and the Nafion-MWCNTs PME performed excellent repeatability and durability. The proposed sensor was successfully applied for the determination of SAs in real samples and might offer feasibility and applicability for other determination of more complex sulfonamides compounds.

Keywords: Powder microelectrode; Nafion; Carboxyl; Multiwalled carbon nanotubes; Sulfonamides;

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