Novel Ratiometric Electrochemical Sensor for Sensitive Detection of Ag⁺ Ion Using High Nitrogen Doped Carbon Nanosheets

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A novel dual-signal ratiometric electrochemical nanosensor for highly sensitive and selective detection of Ag⁺ ion has been designed on the basis of decreasing overpotential of high nitrogen doped carbon nanosheets and poly(diallyldimethylammonium chloride)-coated oxidized single-walled carbon nanotubes (HNCNs/PDDA/SWCNTs) and highly specific response strategy. The formation of HNCNs/PDDA/SWCNTs nanocomposite not only provides a higher surface area, but also nitrogen-hole microenvironment for retaining the native activity of the reacted Ag⁺ ion. As a ratiometric amperometric sensor, the resulting HNCNs/PDDA/SWCNTs nanocomposite-modified electrode exhibited high sensitivity and selectivity for the detection of Ag⁺ ion in the range of 5 nM-10 μM and 10-200 μM with a detection limit of 1.97 nM (S/N = 3). The results indicated that the synergetic effect with PDDA/SWCNTs changes the analytical path of the HNCNs matrix for Ag⁺ ion detection. This work demonstrated that HNCNs/PDDA/SWCNTs nanocomposite possesses the feasibility and potential applications in electrochemical sensing.

Keywords: High nitrogen doped carbon nanosheets; Amperometric; Ratiometric sensor; Silver ion; Decreasing overpotential

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