NOVEL ELECTROCHEMICAL DETECTION OF ARSENIC (III) AT GLASSY CARBON ELECTRODE MODIfiED WITH NIO-SINGLE WALL CARBON NANOTUBES

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Abstract: A novel and simple procedure to prepare a glassy carbon (GC) electrode (GCE) modified with NiO-single-wall carbon nanotubes (NiO-SWCNTs) for the detection of trace amount of As (III) in aqueous solution has been developed. The NiO-SWCNTs were immersed into buffer solution(pH=7) (direct deposition) for a short period of time (60 s). The surface coverage (Γ) and charge transfer rate constant (ks) of the immobilized As(III) on SWCNTs were 4.56 ×104.5(±0.2) s−1, 2.94 ×10−9 mol cm−2, 7.3 (±0.3) s−1 indicate high loading ability of SWCNTs for As(III) and great facilitation of the electron transfer between electroactive redox center and carbon nanotubes immobilized on the electrode surface. The resulting electrode surfaces and its morphology were examined with cyclic voltammetry (CV), XRD and scanning electron microscope (SEM) techniques.The catalytic rate constant for redox of As(III) was 1.75 (±0.2) ×103 M−1 s−1.The detection limit (S/N = 3) was 11 nMwiththelinearity up to 4 orders of magnitude and sensitivity of 111.3 nA/μM. The response time of the electrode toachieve 95% of the steady-statecurrent is lower than 2 s. This modified electrode recedes many advantageous such as remarkable catalytic activity, good reproducibility, simple preparation procedure and long-term stability of signal response during arsenic oxidation. Cyclicvoltammograms of the NiO-SWCNTs indicate a pair of well defined and nearly reversible redox couple with surface confined characteristic at wide pH range (3–12).

Keywords: NiO-SWCNTs, Glassy carbon-modified electrode, Cyclicvoltammetry,Arsenic detection.