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Highly sensitive detection of hexavalent chromium utilizing a sol-gel/carbon nanotube modified electrode

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Dedicated to the 80th birthday of Prof. Hong-Yuan Chen

Abstract. A pyridine-functionalized thin film has been fabricated to selectively preconcentrate Cr(VI) anions for electrochemical detection in the 5-300 $\mu\text{g L}^{-1}$ range. Glassy carbon electrodes were modified through physical deposition of single-walled carbon nanotubes (SWNTs) on the electrode surface, followed by electrochemical deposition of a sol-gel containing a 2-pyridine functional group. The use of SWNTs has increased sensitivity for Cr(VI) detection in aqueous solutions, providing a detection limit of 0.8 $\mu\text{g L}^{-1}$.

Highlights:

- Cr(VI) detection: 5-300 $\mu\text{g L}^{-1}$ range; 0.8 $\mu\text{g L}^{-1}$ detection limit
- Sol-gel thin film electrodeposited over a carboxylated SWNT layer on GCE surface
- Sol-gel doped with 2-pyridinium to preconcentrate HCrO_4^-
- Lowering detection limit by three orders of magnitude through the use of SWNTs

Keywords: chromium detection, single-walled carbon nanotubes, glassy carbon electrode, sol-gel, thin film, iridescence

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