

**Kinetic, isotherm and thermodynamic studies of adsorption behaviour of CNT/CuO
nanocomposite for the removal of As (III) and As (V) from water**

Devendra Kumar Singh, Sweta Mohan, Vijay Kumar, Syed Hadi Hasan*

Department of Chemistry, Indian Institute of Technology (Banaras Hindu University), Varanasi-
221005, India

*** Corresponding Author**

E-mail address: shhasan.apc@itbhu.ac.in

Phone: +91-5426702861; Mob.: +91-9839089919

Fax: +91-5422368428

Preparation of CNT

The CNTs used in this study were prepared from arc-discharge method. The arc-discharge method is a high temperature process in which the derived product and yield depend on the internal pressure of chamber. The chamber of arc-discharge unit was evacuated with the vacuum pump and then helium gas was introduced to maintain constant pressure 250 torr inside the chamber. The graphite anode of dimension 5cm×0.8cm×0.8cm and graphite cathode of dimension 3cm×1cm×1cm were adjusted 1 mm apart from each other. The arc-discharge was operated at dc current of 80 A for 15 min. The iron frame was used for the collection of prepared CNTs.

The synthesized CNTs were purified with concentrated nitric acid to remove the metal impurities. For the purification purpose 0.5g of CNTs were mixed with 50 mL of concentrated nitric acid and kept under the stirring for 8 h. CNTs were separated from nitric acid through centrifugation at 10000 rpm for 15 min and then washed repeatedly with deionised double distilled water to maintain a neutral pH. The washed CNTs were dried at 120 °C for 10 h.

Preparation CNT/CuO nanocomposite

In order to make the composite of CuO with CNTs the decoration of CuO nanoparticles over the surface of CNTs was performed through precipitation using $\text{Cu}(\text{CO}_2\text{CH}_3)_2 \cdot \text{H}_2\text{O}$ as a source of cupric ion in the presence of CNTs in the reaction mixture. In a typical process, 0.158g $\text{Cu}(\text{CO}_2\text{CH}_3)_2 \cdot \text{H}_2\text{O}$ was dissolved in 250 mL flask containing 50 mL of water and subsequently 1 mL of glacial acetic acid was added. In another flask 0.08 g of CNTs were suspended in the 10 mL ethanol (95%) by sonication and then it was added into the $\text{Cu}(\text{CO}_2\text{CH}_3)_2 \cdot \text{H}_2\text{O}$ solution with continuous stirring. After 10 min of stirring 0.8 g of NaOH was added to the reaction mixture.

The resulting mixture was then refluxed at 90 °C for 2 h with vigorous stirring. Thereafter, reaction mixture was cooled at room temperature. The product was separated as a black mass from reaction mixture by centrifuging at 8000 rpm for 10 min. The collected black mass was washed through dissolving in deionized double distilled water under sonication and followed by centrifugation. The washing process was repeated till a neutral pH was achieved. The obtained black mass which is expected to be CNT/CuO nanocomposite was dried at 150 °C for 10 h. Finally, dried CNT/CuO nanocomposite was characterized and stored for further use in As (III) and As (V) adsorption experiments.

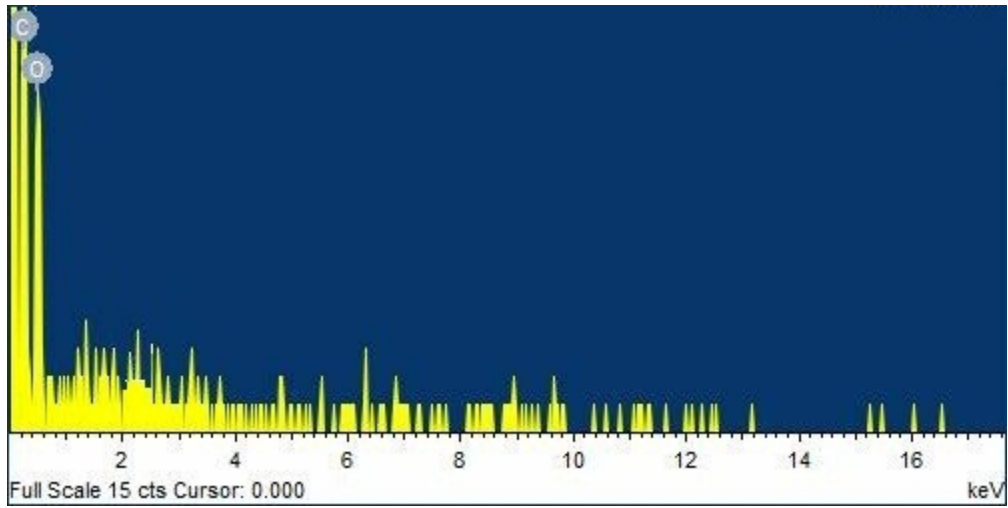


Figure S1: EDS spectra of CNTs

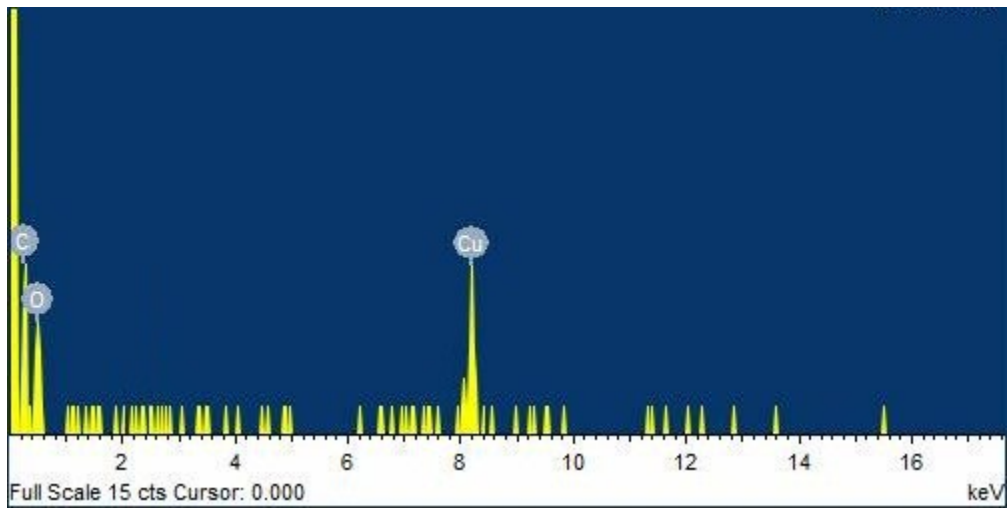
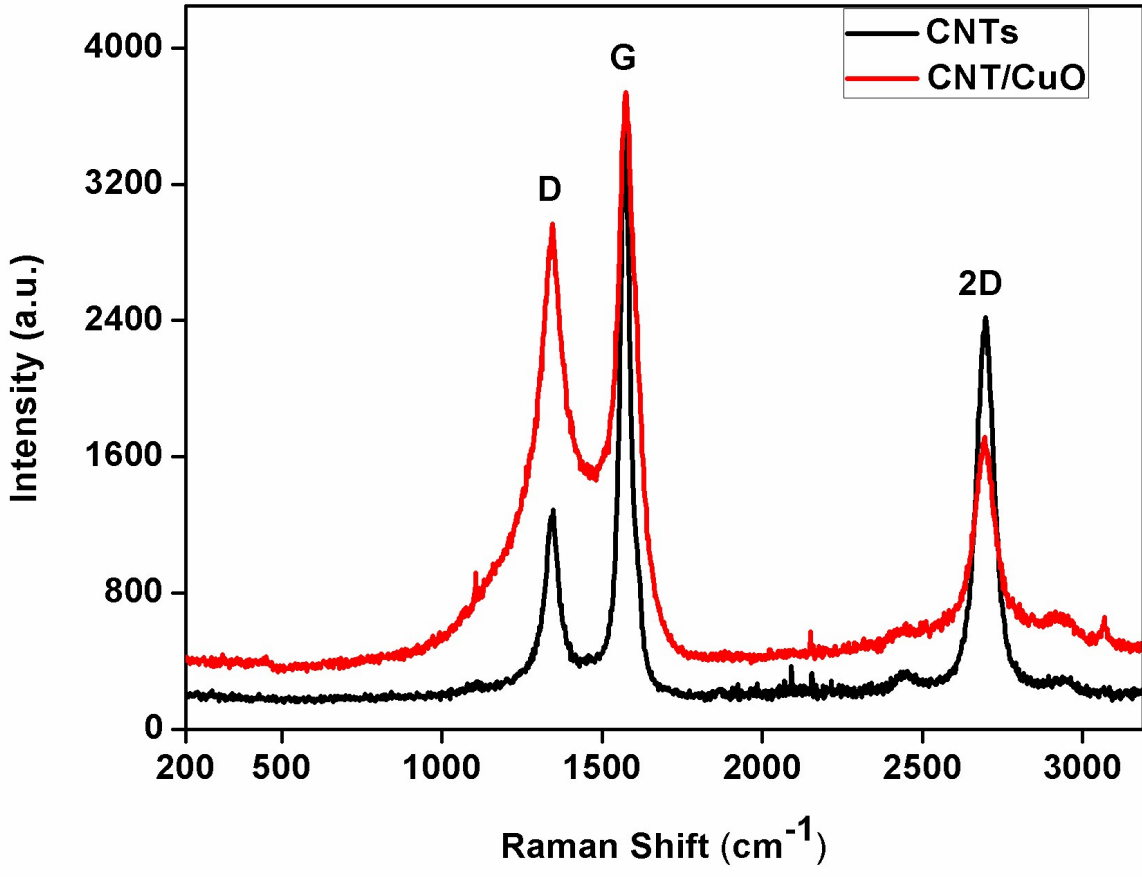


Figure S2: EDS spectra of CNT/CuO nanocomposite



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Figure S3: Raman spectra of CNTs and CNT/CuO nanocomposite

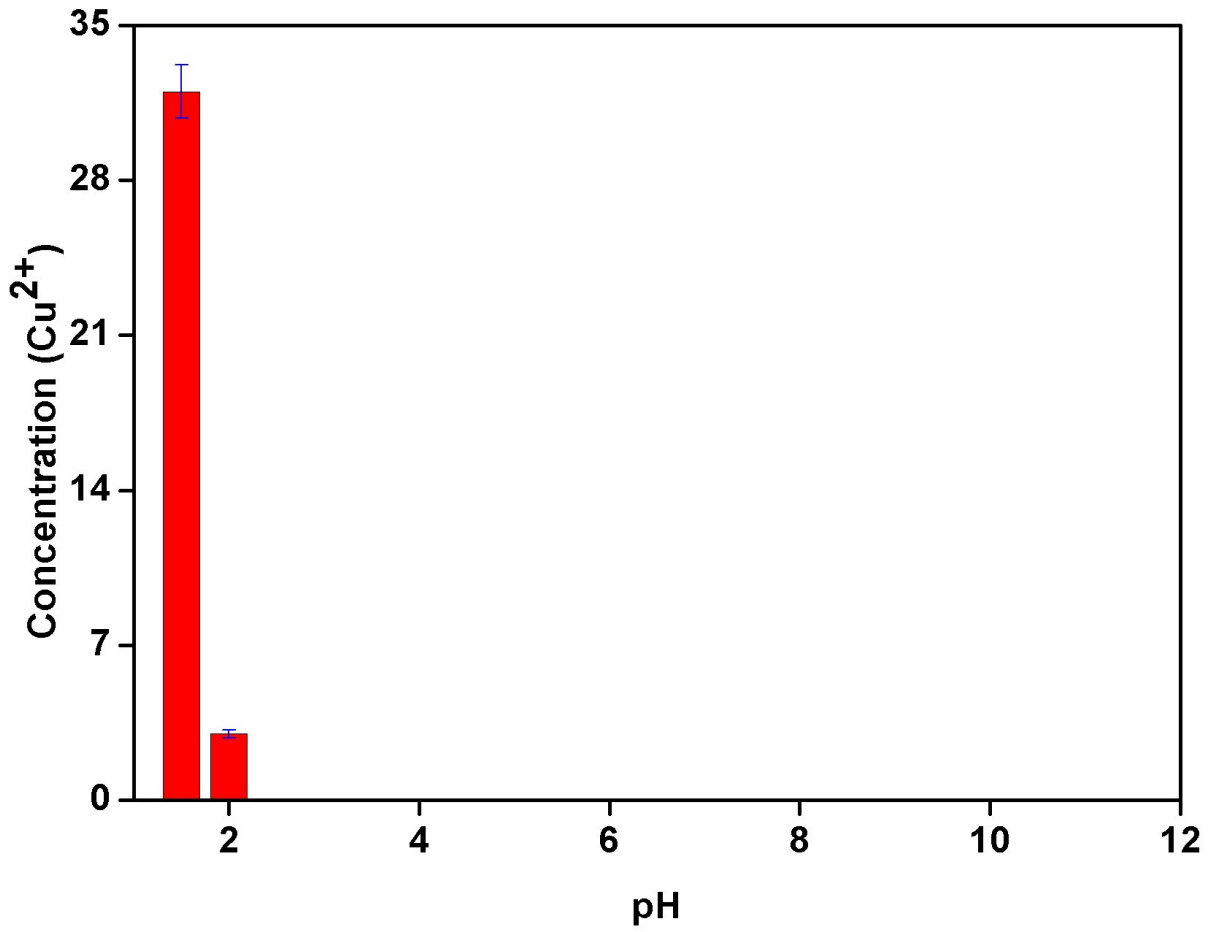


Figure S4. Effect of pH on the stability of the CNT/CuO