

## SYNTHESIS OF CNT-CLAY NANOCOMPOSITE FOR APPLICATION IN As (III) REMOVAL FROM WATER

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### ABSTRACT

The high aspect ratio is well known property of carbon nanotubes (CNT) among all other specialised qualities. However, because of their high cost, its application is limited. Therefore, it is always desirable to design novel material by modifying CNT as well as combining it with other low cost materials which could be efficiently used as an economically viable adsorbent. The present study is focused on the development of a novel composite material using CNT and kaolinite clay with their application in As (III) removal. Functionalization of these two materials was carried out to get desired bonding. The CNT/Clay nanocomposite (CCN) was then synthesised by solution mixing method. The structural properties of the fabricated CCN were studied using XRD, FT-IR, SEM, HR-TEM. HRTEM images show that the CCN particle sizes are in the range of 5–10 nm. The FT-IR spectrogram of nanocomposite showed a fresh spectrum band at  $1682\text{ cm}^{-1}$  (Yadav et al., 2018) and result is supported by XRD analysis. Findings from the SEM images showed that CCN has uniform dispersion and unique morphology.

Application of this newly synthesized CCN has been studied for adsorption of As (III). Various factors, including pH, Equilibrium time, temperature, initial metal concentration and amount of adsorbent correlated effectively with As (III) adsorption. The kinetics and thermodynamic studies were also performed and results indicated that it is an exothermic and spontaneous adsorption process. The maximum removal efficiency of CCN for As (III) was found to be 99.7% and adsorption capacity was  $1.06\text{ mg g}^{-1}$ . The favourable conditions for adsorption are pH: 6.0; contact time: 60 min; temperature: 308K; initial concentration:  $1.22\text{ mg L}^{-1}$  and adsorbent dose as  $0.5\text{ g L}^{-1}$ .

**Keywords:** Carbon nanotube (CNT), clay, Nanocomposite, novel material, adsorption