Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2017.20454

67 (2017) 397–405
March

Tartrazine removal from water using functionalized multiwall carbon nanotubes

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Received 15 October 2016; Accepted 18 December 2016

ABSTRACT

This investigation presents the advantages and limitations of tartrazine azo dye sorption on oxygen functionalized multiwalled carbon nanotubes (O-MWCNTs) synthesized by catalytic-CVD technique in LEREC laboratory, Algeria. Our adsorbent was characterized by FESEM, HR-TEM micrographs, Raman spectroscopy, ATG, XPS and specific surface area measurements (S_{BET}). The effects of different operational parameters like contact time, initial concentration of tartrazine, adsorbent amount, pH and temperature on the sorption processes were studied in batch mode. Experiments showed that the O-MWCNT was efficient for the removal of tartrazine and the equilibrium can be reached in 60 min. The removal efficiency was found to be dependent on the initial dye concentration and there is no significant effect of temperature on the adsorption process. Also, acidic pH was found to be favorable for dye removal, while the adsorption capacity decreases with the O-MWCNTs amount. For comparison, a similar study has been performed with a commercial activated carbon (CAC) and it was found out that the functionalized MWCNT has a shorter equilibrium time and higher dye adsorption capacity than CAC, so that O-MWCNTs can be considered as potential adsorbents for dye removal from wastewater. The models of Langmuir and Freundlich isotherms are applicable to describe the process of tartrazine adsorption on the O-MWCNTs and also on the CAC conventional adsorbent.

Keywords: Multiwalled carbon nanotubes; Activated carbon; Functionalized MWNT; Specific surface area; Adsorption kinetic; Azo dye

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