Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2015.1062433

57 (2016) 14178–14187
June

Taylor & Francis
Taylor & Francis Group

TiO_2-nanostructured carbon composite sorbent/photocatalyst for humic acid removal from water

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Received 3 March 2015; Accepted 9 June 2015

ABSTRACT

In this study, two types of nanostructured carbon–TiO_2 within epoxy matrix, i.e. carbon nanotubes-TiO_2-Epoxy (CNT-TiO_2-Epoxy) and carbon nanofiber-TiO_2-Epoxy (CNF-TiO_2-Epoxy) have been prepared, characterized and tested as sorbent and photocatalysts for humic acids (HAs) removal from water envisaging advanced drinking water treatment. The HA adsorption capacities of CNT-TiO_2-Epoxy of 8.68 mg g^{-1} and CNF-TiO_2-Epoxy of 7.14 mg g^{-1} were determined using Freundlich isotherm and pseudo-second-order kinetics model. Also, the photocatalytic activities of both composites were assessed in terms of HA degradation efficiency and rate constant and an enhancement effect was found for CNT-TiO_2-Epoxy composite for HA removal. CNF-TiO_2-Epoxy photocatalytic performance was worse vs. simple TiO_2 traditional catalyst in terms of degradation efficiency, but five times faster from the kinetics point of view. The lifetime and the regeneration pathway by the photocatalysis were assessed for CNT-TiO_2-Epoxy composite system in comparison with the sorption applications. A HA removal efficiency of 43.8% was found by photocatalysis vs. 30.2% reached by the sorption after successive five running. A regeneration degree of about 25% was achieved under the similar conditions of photocatalysis without HA presence.

Keywords: Carbon materials; Titanium dioxide; Humic acid; Sorption; Photocatalysis

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