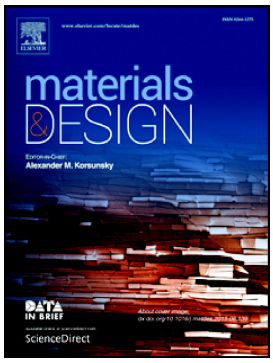
Accepted Manuscript



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PII: S0264-1275(17)30303-9
DOI: doi: 10.1016/j.matdes.2017.03.055
Reference: JMADE 2889

To appear in: *Materials & Design*

Received date: 7 December 2016
Revised date: 17 March 2017
Accepted date: 19 March 2017

Please cite this article as: Qian Jia, Chunli Song, Hongyan Li, Yuanyuan Huang, Lina Liu, Yikai Yu , Construction of polycationic film coated cotton and new inductive effect to remove water-soluble dyes in water. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), doi: 10.1016/j.matdes.2017.03.055

Construction of Polycationic Film Coated Cotton and New Inductive Effect to Remove Water-soluble Dyes in Water

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Abstract

In order to realize the high efficient purification of dyeing waste-water, we designed the construction of the polycationic film coated on cotton. We firstly detected that the crystallization spaces of natural cotton could be decreased by triethanolamine pretreatment, so that the cationic reagent:3-chloro-2-hydroxypropylmethyldiallylammonium chloride (CMDA) could be grafted more efficiently, in turn forming the higher cationic degrees of grafting cotton (G-cotton). Subsequently, a copolymerization of another cationic monomer: dimethyldiallylammonium chloride (DMAC) with the cationic CMDA units in G-cotton was carried out, to obtain the polycationic film coated cotton (PF-cotton). Under equal conditions, the G-cotton adsorption capacity of anionic dyes was 15.70 times of that of activated carbon, while the PF-cotton adsorption capacity was near to that of G-cotton, but the average adsorption rate of PF-cotton was 2.8 times of that of G-cotton, indicating that the obtained PF-cotton was very suitable to purify the dyeing waste-water. Moreover, the PF-cotton had a wide range of application universal, e.g., enlarged use, adsorbing different dye solutions and simulated dyeing waste water, being a filtering filler, and recycling utilization. In addition, we also detected that a new inductive effect occurred in the process of PF-cotton adsorption, playing an important role in speeding up the adsorption.

Keywords: polycationic film, cotton adsorbent, inductive effect, dyeing waste-water

1. Introduction

The dyeing waste-water with high chroma and high COD value seriously pollutes water environment, and this issue has become a global problem [1-3]. Comparing to the removal of insoluble pollutants in most of reported literature (e.g., removal of suspended particles), it is especially difficult to remove the water-soluble dyes with high dispersion and high stability in water phase [4]. There are so many ways to deal with dyeing waste-water, while the adsorption method is one of the most common ways, and the key factor lies in the adsorbent selection [5-8]. By far, activated carbon has been one of the earliest application and the most excellent adsorbents, due to the multi-pore and interconnected network structure with a large ratio surface area to produce a strong Van Edward adsorption of pollutants in water. Some researches show that activated carbon has also a good effect on purification of dyeing waste-water, but it is not ideal for the adsorption of some large-sized dyes or other large-sized pollutants, due to the limitation of its pore size [9-12]. Therefore, in recent years, activated carbon adsorption is mostly used for the deep treatment (e.g., tertiary treatment) of remaining small-sized pollutants in dyeing waste-water or combined with oxidizing substances (e.g., O_3, ClO_2, H_2O_2, CuO, Fe_2O_3, V_2O_5, and Fenton reagent) to decompose