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Journal	Key Engineering Materials (Volume 450)
Volume	Advanced Design and Manufacture III
Edited by	Daizhong Su, Qingbin Zhang and Shifan Zhu
Pages	445-448
DOI	10.4028/www.scientific.net/KEM.450.445
Citation	Zheng Wang et al., 2010, Key Engineering Materials, 450, 445
Online since	November, 2010
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Keywords	Activated Carbon (AC), Adsorbent, Adsorption, Attapulgite, COD, Micro-Polluted Water, Reduction

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First page example

Key Engineering Materials Vol. 450 (2011) pp 445-448
Online available since 2010/Nov/11 at www.scientific.net

doi:10.4028/www.scientific.net/KEM.450.445

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Keywords: reduction; COD; micro-polluted water; adsorption; activated carbon; attapulgite; adsorbent

Abstract. The aim of this study was the assessment of reduction of chemical oxygen demand (COD) from micro-polluted water using activated carbon-attapulgite composite adsorbent prepared using activated carbon and natural attapulgite through compounding, granulation and calcination. The complete study was done in batch mode to investigate the effect of operating parameters. Adsorption of COD was found to be dependent on contact time, pH, temperature and initial COD concentration. Adsorption equilibrium attained within 80 minutes time. The optimum pH range for adsorption of organics was found to be 8. The sorption of organics decreased with rise of temperature because adsorption process was exothermic. The studied adsorption data fitted well to Langmuir adsorption model with the correlation coefficient 0.9947. The activated carbon-attapulgite composite adsorbent in this study shows very good promise for practical applicability on removal of COD from micro-polluted water.

Introduction

The micro-polluted water typically contains organic pollutants which can be denoted by chemical oxygen demand (COD). For curtailing the environmental and health hazards, the COD need to be removed to permissible limits for safe disposal of drinking water [1]. Activated carbon is carbon treated at high temperature with a physical or chemical activating agent producing an internal porous particle structure and has been used for many years in wastewater treatment [2]. Attapulgite clay is a crystalline hydrated magnesium silicate with a fibrous morphology, large specific surface area and moderate cation exchange capacity, which is beneficial for the adsorption of heavy metals from solution[3].Basing on the aforesaid traits of diatomite-attapulgite composite nano-size adsorbent and attapulgite-zeolite composite nano-structure adsorbent on removal of pollution, a new activated carbon-attapulgite composite adsorbent was prepared using activated carbon and natural attapulgite through compounding, granulation and calcination [4]. The main targets of this paper are to find out the possibility of using this adsorbent for the organic matter defined as COD reduction from micro-polluted water.

Materials and Methods

Materials and Instrumentation. A stock solution of 500 mg/L of COD was prepared by dissolving glucose in de-ionized water and was used to prepare the sorbate solutions of concentrations by appropriate dilution for different experiments performed. The sample of activated carbon-attapulgite composite adsorbent was obtained from Cikon CO.LTD (Changzhou, China). The intrusion data including pore surface area and pore size distribution of the adsorbent was carried out by using a mercury porosimeter (Autopore 9500, Micromeritics, USA). A digital pH meter (PHS-3C, PSI CO.LTD, Shanghai, China) was used for pH measurement.

Batch Adsorption Experiments. A typical sorption experiment was conducted by using the necessary activated carbon-attapulgite composite adsorbent in a 250mL stopper conical flask batch at desired contact time, pH value, temperature and COD concentration level. The pH values of the solution were adjusted by adding negligible volumes of 0.1 M HCL or NaOH. The flask was shaken