

Adsorption of Phenol and Basic Dye on Carbon Nanotubes/Carbon Fabric  
Composites from Aqueous Solution

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Abstract

The liquid-phase adsorption of phenol and dye (basic violet 10) onto carbon nanotube (CNT)-activated carbon fabric (ACF) composites, prepared by a catalytic chemical vapor deposition (CCVD) approach, has been investigated. The CCVD technique enables the decoration of CNTs on microscaled ACFs, creating a hierarchy CNT-ACF composite. The as-grown nanotubes were found to have a tortuous shape and to be several micrometers in length. The deposition of CNTs efficiently shifts the micropore size distribution of ACFs to mesoporosity. The adsorption isotherms for phenol and BV10 on ACF and CNT-ACF adsorbents are well characterized by the Dubinin-Radushkevich and Langmuir models. The surface accessibility, the equilibrium rate constant, and the adsorption energy are significantly enhanced due to the deposition of CNTs, as analyzed by these models. Accordingly, the existence of CNTs on ACF adsorbent plays a positive role in facilitating pore accessibility to adsorbate and providing more adsorptive sites for the liquid-phase adsorption.

Keyword : activated carbon fabrics; adsorption; basic dye; carbon nanotubes; chemical vapor adsorption; phenol