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# 1 Comparative Study of Carbon Nanotubes and Granular Activated 2 Carbon: Physicochemical Properties and Adsorption Capacities

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## 9 Highlights

- 10 • Surface area of SWNTs treated with 3N HNO<sub>3</sub> for 3 hours was higher than the raw  
11 sample.
- 12 • Nitric acid treatment removed impurities up to a point, but that amorphous carbon  
13 reformed with 10 hour treatment with 6N acid.
- 14 • At typical bed cleaning time, toluene adsorption capacity of treated SWNTs exceeded  
15 that of GAC.
- 16 • Physical/chemical analyses showed no substantial difference for pre-treated MWNTs  
17 compared to raw MWNTs.
- 18 • Adsorption capacity of SWNT and GAC for toluene substantially exceeded that of  
19 MWNTs.

## 22 ABSTRACT

23 The overall goal was to determine an optimum pre-treatment condition for carbon nanotubes  
24 (CNTs) to facilitate air pollutant adsorption. Various combinations of heat and chemical pre-  
25 treatment were explored, and toluene was tested as an example hazardous air pollutant adsorbate.  
26 Specific objectives were 1) to characterize raw and pre-treated single-wall (SW) and multi-wall  
27 (MW) CNTs and compare their physical/chemical properties to commercially available granular  
28 activated carbon (GAC), 2) to determine the adsorption capacities for toluene onto pre-treated  
29 CNTs versus GAC.

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