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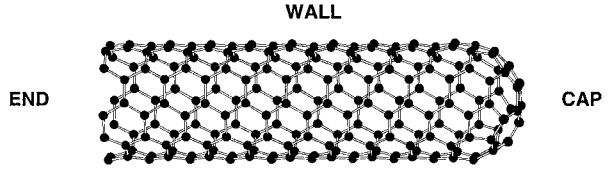
GUEST EDITORIAL

Carbon Nanotubes

Few materials have elicited such glowing reviews as carbon nanotubes (CNTs). Widely recognized as the quintessential nanomaterial, CNTs have already compiled an impressive list of superlatives since their discovery in 1991.[1] Carbon nanotubes are recognized as the ultimate carbon fiber with the highest strength of any material[2] and the highest thermal conductivity,[3] and they have been shown to possess outstanding field emission properties.[4] Metallic carbon nanotubes transport electric current ballistically—they do not dissipate heat.[5] They can also function as the active semiconductor in nanoscale devices,[6] all as a result of their unique topologically controlled electronic properties.[7]

Carbon nanotubes were initially the province of scientists interested in their unique physical properties, but over the past few years interest has begun to focus on their chemical properties. Thus, this special issue of *Accounts of Chemical Research*, which brings together contributions from some of the leading practitioners of carbon nanotube science, is both timely and informative for the chemical community. Functionalization has been demonstrated at the ends and walls of carbon nanotubes. Due to the relative curvatures, the caps seem to be much more reactive than the walls of the nanotubes, and are readily lost during chemical processing. The chemical aspects of carbon nanotube science have only been under investigation for about five years, but in this short time the present issue of *Accounts* documents impressive progress.



Nevertheless, it seems fair to say that the real opportunities for carbon nanotube chemistry still lie in the future. There is probably no other material with so much potential, but which offers so many challenges: from the preparation of the carbon nanotubes;[8−12] their purification from catalyst residues, carbon nanoparticles, and amorphous carbon; their separation according to length, diameter, and chirality into semiconducing and metallic nanotubes; and finally to the in-depth understanding and control of their formation and chemistry. All of these challenges lie before us—impure carbon nanotubes still cost more than gold!

Carbon nanotubes provide the archetypal example of the promise of nanomaterials—unparalleled performance in a host of properties. Mastery of carbon nanotube chemistry is the missing element in the widespread application of this amazing material.

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