

291q Investigation of Selective Reaction of Single-Walled Carbon Nanotubes: Mechanism and Applications

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Single-walled carbon nanotubes (SWNTs) exhibit unique electronic, mechanical, and optical properties, making them the subject of intense investigation. Depending upon their chirality, individual carbon nanotubes are semiconducting or metallic. Chemical reactions that are selective to the electronic structure of single-walled carbon nanotubes have become increasingly important from both technological and theoretical perspectives. Recently, a SWNT electronic structure selective chemistry was demonstrated using 4-chlorobenzene diazonium to selectively react metallic over semiconducting nanotubes in an aqueous solution. In this work, we examine the mechanism of the 4-chlorobenzene diazonium reaction with emphasis on selectivity implications. Also, selective reaction is extended to the 4-hydroxybenzene diazonium salt, a more useful reagent from an applications standpoint. Finally, applications involving diazonium-functionalized SWNT, including separation by functionalization using gel electrophoresis, are investigated.