

Mapping the One-dimensional Electronic states of Nanotube Peapod Structures

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Nanoscale peapods, which consist of encapsulated arrays of C_{60} molecules nested inside single wall nanotubes (SWNTs), represent a new class of nanoscale materials having tunable properties. We report the first electronic measurements of this system using a scanning tunneling microscope (STM). Our results demonstrate that the encapsulated C_{60} modify the local electronic structure of the SWNT cage. Furthermore, our measurements and calculations show that a periodic array of C_{60} molecules gives rise to a new hybrid electronic band, which derives its character from both the SWNT states and the C_{60} molecular orbitals. Our experiments and theoretical calculations suggest that encapsulation provides additional means of control over the electronic states of SWNTs, which are already at the heart of many proposed approaches towards nanoelectronics.