Nanotechnology with Carbon: Fullerenes, Nanotubes, Peapods

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In view of their atomic-level perfection, the efficient formation of fullerenes, nanotubes, peapods and other sp2 bonded carbon nanostructures raises questions about the role of defects and their elimination during the hierarchical self-assembly process. Combining ab initio calculations with molecular dynamics simulations, I will show that defects may assist in the efficient inter-conversion of nanostructures, such as multi-wall nanotubes and scrolls [1], and in the formation of new systems including foams and peapods [2,3]. The unusual stability of carbon nanostructures, both at high temperatures and under electronic excitations, stems from their ability to reduce the impact of defects such as atomic vacancies [4]. The efficiency of the self-healing mechanism increases with decreasing system size, with interesting implications for device application.

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