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Carbon Nanotubes: From Basic Science to Applications

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Abstract:

Presence of chirality in carbon nanotubes make them unique subject for both fundamental science and application since their properties are delicately reliant on chirality. Despite certain progresses, fundamental aspects of chirality origination in carbon nanotubes still remains in the center of research interest worldwide, since this complex multidisciplinary problem requires developing thermodynamics and kinetics in nanoscale. Specifically, revealing the interplay between metal nanoparticle features, which serves as a catalyst /substrate and intrinsic properties of carbon embryo during nucleation and growth of carbon nanotube.

Peculiarities of metal nanoparticle thermodynamics such as melting points, binary and ternary phase diagrams, structure and their role in the growth and symmetry formation of carbon nanotubes within the nucleation kinetic theory will be presented and discussed.

In the meantime, the recent progress in the synthesis of high quality and low cost SWNTs has raised expectations industrial scale applications of nanotubes. Practical opportunities toward unique industrial scale applications of carbon nanotubes, particularly for high energy density batteries, extremely sensitive sensors, materials for heat management and interconnects for electronics will be presented.

