

NANOSCIENCE AND NANOTECHNOLOGY OF NANO-CARBON MATERIALS

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Nanoscience is largely dependent on controlling the nanometer-sized structures of materials. A typical example is carbon nanotubes whose unique properties have been investigated in details theoretically and experimentally. Some of carbon nanotubes have been demonstrated to become semiconducting and others are metallic, depending on whether the nanotubes have chiral structure or achiral one. Controlling the structures of carbon nanotubes is also practically important in term of industrial application since we make thin film transistors of single walled carbon nanotubes.

Another important issue for Nanoscience of nano-carbon materials is to know exact atomic structures of such basically non-periodic structures, and for this purpose a powerful electron microscope comes in. We thank for the recent advanced technology of electron microscopes which are equipped with spherical aberration corrected objective lenses that allow us to observe individual atoms of even light element such as carbon and boron. Furthermore dynamic behaviors of such light element material objects have brought us a new sight of nanostructures that are induced by heating as well as electron beam irradiation.

As examples mentioned above we demonstrate some latest results on structural characterization of carbon nanotubes(1-5), graphene(6), and boron nitride thin films(7), including “monatomic carbon strings (ultimate quantum wire!)” that have been successfully made and observed in our laboratory(8).

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