Dynamic processes of nano-materials revealed by atom-resolution electron microscopy

Sumio Iijima[1,2,3,4]
[1]Faculty of Science and Technology, Meijo University
[2]National Institute of Advanced Industrial Science and Technology /Nanotube Research Center,
[3]SAINT and [4]NEC
1-501, Shiogamaguchi, Tenpaku, Nagoya 468-8502, Japan

Nanoscience deals with nano-scale structures of materials and therefore controlling the structures is crucial. A typical example of nanostructures is carbon nanotubes and their many unique properties have been investigated theoretically and experimentally, and brought a new concept of materials into condensed matter physics. More importantly, nanoscience is closely related to nanotechnology and thus to industrial applications as we see in many fields of carbon nanotube research.

An important issue for nanoscience research is characterization of the materials and many methods have been developed. In the case of carbon nanotubes their exact atomic structures are determined by means of electron microscopy, Raman and photoluminescence spectroscopy, etc., where sometimes commercially available instruments are not sufficiently enough and need substantial modification for each particular purpose, where "do it yourself" becomes important.

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 that have been successfully made and observed in our laboratory(8).

A particular emphasis will be on quasi-real-time observation of nanostructures by a conventional HRTEM equipped with an aberration correction system, which is not available for a scanning mode microscopy.

References

[1] K. Suenaga, et al. Nature Nanotech. **2**, (2007) 358.
[2] Z. Liu, et al., Nature Nanotech., **2**, (2007) 422.
[3] Y. Sato, et al., Nano Lett, **7**, (2007) 3704.
[4] C. H. Jin, et al., Nature Nanotech. **3**, (2008) 17.
[5] C. H. Jin, et al., PRL, **101**, (2008) 176102 (1)-(4).
[6] Z. Liu, et al., PRL, **102**, (2009) 015501 (1)-(4).
[7] C. H. Jin, et al., PRL, **102**, (2009) 195505 (1)-(4).
[8] C. H. Jin, et al., PRL, **102**, (2009) 205501 (1)-(4).