

Nano-carbon Materials: Synthesis and Characterization

Sumio Iijima

Faculty of Science and Technology, Meijo University, Tenpaku, Nagoya, Aichi, Japan
and, National Institute of Advanced Industrial Science and Technology / Nanotube Research Center
and, NEC Corporation
ijimas@meijo-u.ac.jp

Formation of a large size graphene sheet by a thermal CVD method using a copper substrate foil has been reported. The method requires a high temperature CVD reactor (near 1000°C), so that it cannot be used in a conventional Si device process and therefore an alternative low temperature synthesis of graphene is needed. For this purpose we utilized a new surface-wave micro-wave CVD method which has been developed originally for the nano-diamond film growth at low temperature down to room temperature. We shall demonstrate the growth of an A4-size graphene sheet formed at 300°C.

Another subject to be presented is concerned with structural characterization of nano-carbon materials using atom-resolution electron microscopes as well as other characterization methods. The advantage of high resolution electron microscopy (HRTEM) over other techniques is to be able to characterize local atomic structures such as lattice defects and edge structures of nano materials which cannot be studied in conventional techniques. Another emphasis of HRTEM will be on dynamic observation of a reaction process which is not available for other high resolution probe microscope techniques such as STM. A recent progress of HRTEM technology such as aberration correction and EELS, has allowed us to do elemental analysis, distinction of charge valency and more on the individual atom basis. Some latest examples of above mentioned observations on graphene edge structures and electronic states will be demonstrated.