Nano-Carbon Materials and Their Characterizations

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A transmission electron microscope (TEM) was invented in 1937 to overcome the resolution limit of optical microscope. Ever since researchers have dreamed to see directly individual atoms under the electron microscope and the dream has come true in the 1970s. Fortunately I have been able to produce the very first images of atoms in a crystal on an improved electron microscope in 1971. The technique now has been used widely in many areas of material sciences, condensed matter physics, mineralogy, biology, etc. The modern electron microscopes, including elemental analysis such as electron energy loss spectroscopy (EELS) and energy dispersive X-ray analysis (EDX), have been continuously improved and now allowed us to characterize nano-materials at individual atom basis.

The high resolution TEM technique would have played an important role in discovering carbon nanotube which has initiated nano-science and nano-technology. Nano-science means that we deal with a matter that is classified as something between an atom and a bulk solid in size. Therefore we need a high power TEM to characterize those materials. Structural characterization is the basis of nanoscience and nanotechnology.

In this presentation I will speak about the latest research on nanocarbon materials synthesis and their possible applications. Then I will describe the present state of art of TEM studies particularly on nano-carbon materials with emphasis on their dynamic behaviors, and also ultimate elemental analysis due to EELS and EDS using a precisely controlled electron beam.