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Progress of Nanoscience and Nanotechnology in China

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Abstract

Nanoscience and nanotechnology has been attracting wide attention and is becoming an active frontier area. Chinese scientists have followed with the main stream interest in the development of nanoscience and nanotechnology since its initial stage. In my presentation, the achievements and present status in China in relative researches such as nanomaterials, nanodevices and characterization of nanostructure, are described.

The importance of nanoscience and nanotechnology has been considerably realized by the relevant Chinese administrative sectors. Some financial supports were also given to support the research endeavors in this field. In the middle of 1980s, CAS and National Science Foundation of China(NSFC) initiated support on the development of SPM and other scientific issues at the nanometer scale (1987-1995). The State Science and Technology Commission (SSTC) of China approved the "Climbing up" project and supported nanomaterial science for ten successive years from 1990 to 1999. In 1999, the Ministry of Science and Technology started a national key basic research project "Nanomaterial and Nanostructure", to continually support the basic research on nanomaterials such as nanotubes. The National High Technology Plan also sets up a series of projects for nanomaterial applications.

According to incomplete statistics, there are more than 50 universities and 20 institutes of CAS, with the addition of more than 300 enterprises, have engaged in the research and development of nanoscience and nanotechnology, involving about 3000 researchers from different institutes and universities all over the China. The research subjects of nanoscience and nanotechnology in China are, in general, comprehensive and somewhat dispersed. To better concentrate Chinese research faculties of nanoscience and nanotechnology and drive the rapid development of its nanoscience and nanotechnology, the National Center for Nanoscience and Nanotechnology was officially inaugurated on March 22, 2003, with the Center for Nanoscience and Nanotechnology Center of Chinese Academy of Sciences, Peking University and Tsinghua University as the initiators and founders.

Researchers of CAS pioneered the investigations on nanoscience and technology in China. A series of significant research projects were carried out starting in the late of 1980s. Several institutes including the Institute of Physics, Institute of Chemistry, , Shenyang Institute of Metal Research, Shanghai Institute of Ceramics, Hefei Institute of Solid State Physics, University of Science and Technology of China and others were organized and were vigorously engaged into the research on nanoscience and nanotechnology. The principal fields supported by CAS are as follows: bond-selective chemistry and the manipulation of single atoms under the control of laser; molecular electronics research on molecular materials and molecular devices; giant-magneto resistance materials and related physics; photocatalytic and photoelectronic chemistry study of nanosemiconductor; SPM studies on surface and interface as well as macromolecules; study on carbon nanotube and other nanomaterials; study on the structure and physical properties of artificial "super-atoms", etc. In addition, CAS is also undertaking a number of national key projects.

It is noticed that the drive of nanoscale science and technology in China and outside China began at almost the same starting line, and that China has made significant progress in some aspects. According to the Scientific Citation Index, the total amount of papers related to nanoscience and nanotechnology published by scientists in China is in the front rank, compared with those in other countries. The amount of papers by scientists in China related to carbon nanotube ranked the third, just behind United States and Japan. CAS ranked the fourth by citations and citation impact in nanotechnology research from 1992 to 2002, just behind Univ. Calif., Berkeley, IBM, and MIT. Appreciable differences of overall level still exist between China and other developed countries, especially in the area of nanoscale devices and in industrialization.

Tens of nation-wide conferences have been held in China since 1990 covering a wide range of topics in the related fields. In Beijing, the Chinese Academy of Sciences (CAS) sponsored the 7th International Conference on Scanning Tunneling Microscopy(STM'93) and the 4th International Conference on Nanoscale Science and Technology(Nano IV). These conferences have served greatly the academic exchanges and collaborations both nationally and internationally.

The advancement of nanoscience and nanotechnology will not only stimulate the exploration of new phenomenon and new theory, but it will also lead to industrial revolutions and as the consequences, becoming a new driving force for the economic growth in the 21st century.