



Understanding Carbon Nanotube Growth

The discovery of carbon nanotubes in 1991 opened up a challenging new area of research, because they are expected to be ideal building blocks for nanoscale applications due to their extraordinary mechanical and electronic properties. Various production methods have been developed, however precise control of nanotube morphology (e.g. length, diameter) has yet to be realised, a fact which has delayed industrial exploitation. Thus a comprehensive understanding of nanotube growth is essential, and in this talk I will address this important problem, i.e. the controlled production of novel carbon nanomaterials. Recently, it was found that the use of benzene-based aerosols in conjunction with metallocenes produces arrays of well-aligned multi-walled metal-filled (e.g. Fe, Ni, Co) carbon nanotubes of higher purity than known from other techniques. The pyrolysis of hydrocarbons in conjunction with metal particles strongly depends on the catalytic behaviour of metal particles. The aerosol technique allows to characterise nanotube material that is almost free of any unwanted by-products such as metal encapsulated particles and amorphous carbon. Carbon nanotubes can be also modified by replacing atoms of the carbon network with nitrogen, boron or both. The creation of large arrays of nitrogen-doped carbon nanotubes, for example CN_x nanofibres, as well as the formation of $B_xC_yN_z$ will be described.



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Nicole graduated in Chemistry from the University Ulm in Germany in 1996. After a short stay as a visiting student at the University of Sussex she obtained a grant from the Defence Evaluation Research Agency (DERA) and the Japanese Fine Ceramics Center (JFCC) in order to pursue her PhD studies in Chemical Physics on novel carbon nanostructures under the supervision of Sir Harry Kroto and Dr David Walton. In 2001 she received the International Pergamon Prize for an outstanding thesis of the years 1999-2001 in carbon science. Following this, Nicole worked as a research fellow at the Max-Planck Institute in Stuttgart, continuing her work on layered and nanotube composite materials. In September 2003, she returned to the UK in order to take up a Royal Society Dorothy Hodgkin Research Fellowship at Oxford University. She is also the initiator of NanoQuorum, an independent computer aided scientific network in which people can communicate, and exchange ideas and data to facilitate research and teaching. Nicole is a member of the Royal Society (RS)/Royal Academy of Engineering (RAEng) working group on nanotechnology, commissioned by the UK government in July 2003. The report on "Nanoscience and nanotechnologies: opportunities and uncertainties" was published on 29 July 2004. Recently, she was awarded a Research Fellowship at Wolfson College. Nicole is a member of the British Carbon Group Committee and works together with PAL LAB on the public understanding of Science on "Nanotechnology: case studies in new technology – societal and ethical implications".

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Reception to follow