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PRESS BACKGROUNDER

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Nokia Research Center
Nanotechnology: Big potential in tiny substances

Nanotechnology refers broadly to a field of applied science and technology whose unifying theme is the control of matter on the atomic and molecular scale, normally 1 to 100 nanometers, (one millionth of a millimetre) and the fabrication of devices within that size range. Having the freedom to design materials by manipulating atoms and molecules at the nanometer level has allowed many scientifice disciplines to converge on a molecular scale bringing interesting new possibilities to the fore.

Nanotechnology is an exciting area of scientific development which promises 'more for less'. It offers ways to create smaller, cheaper, lighter, faster and more intelligent devices which use fewer raw materials and consume less energy. There are many examples of the application of nanotechnology from the simple to the complex. For example, there are nano coatings which can repel dirt and reduce the need for harmful cleaning agents, or prevent the spread of hospital-borne infections.

Because of the opportunities nanotechnology offers in creating new features and functions, it is already providing the blueprint for solutions to many long-standing medical, social and environmental problems. These include suntan lotion, cosmetics, protective coatings, drug delivery, and stain resistant clothing. For the sportingman or woman there are tennis balls that last longer, golf balls that fly straighter.

As nanotechnology advances, so will its application in everyday items. One example of this is in the mobile device, where scientists are looking at new ways to integrate nanotechnology to help improve how the user interacts with their environment.

Examples of nanotechnology currently in use are: the manufacture of polymers based on molecular structure and the design of computer chip layouts based on surface science. Despite the great promise of numerous nanotechnologies such as 'quantum dots' and 'nanotubes', real commercial applications have mainly used the advantages of 'colloidal nanoparticles' in bulk form.

The history of nanotechnology began in 1959, when Richard Feynman (a physicist of the California Institute of Technology), in his famous lecture "There is Plenty of Room at the Bottom", proposed the concept of nanotechnology. It suggested that the frontiers of knowledge and technology at which people should be aiming could be found not only in physics, but also in nano-sized fields.

In the 1980s, the invention of the scanning tunneling microscope (STM), a computer imaging system with a surface probe, enabled the manipulation of atoms and molecules, which brought the most significant change in this field.

At the cutting edge of innovation

Having the freedom to design materials at the molecular level can enable advanced solutions, improve quality, and enhance users' impressions and experience in many product areas, including mechanics, computing power, energy, manufacturing, and sensing systems. Nanotechnologies will be among the enablers for ubiquitous computing and future mobile communication services.

Nokia wants to contribute to the development of nanotechnologies for materials and manufacturing in order to ensure environmentally sound, safe, and reliable solutions. Closely following developments in all areas of

nanotechnology, even those with no direct or immediate connection to wireless communications, may produce innovative and even surprising uses when applied in the mobile context; this is adequately demonstrated by the form and function of the Morph concept.

Nokia's vision is to use nanotechnology to enhance our lives and for the mobile device to evolve in potentially radical ways. It is an exciting direction for Nokia and one it believes will utterly transform the way that devices are created and used. As well as selecting a material and designing a product from the top down, nanotechnology will enable future developments to be created from their molecular structure upwards offering an entirely new approach to product engineering.

Collaboration is key: Partnering with the best

Nokia Research Center (NRC) is collaborating in the UK with the University of Cambridge's Nanoscience centre and electrical division on an extensive and long term programme of joint research projects. The partnership between Nokia and the University of Cambridge was announced in March, 2007.

Cambridge is widely seen as a leader in nanotechnology research with successes across the University in nanoelectronics, novel materials and coatings, biologically inspired nanostructures and advanced characterization tools.

NRC has established a research facility at the University's West Cambridge site and collaborates with several departments – initially the Nanoscience Center and Electrical Division of the Engineering Department – on projects that, to begin with, will be centered on nanotechnology. Nokia has a strong presence in Cambridge with a team of ten persons on site with the number of Nokia researchers at the University set to rise over time.

Further, NRC and the Helsinki University of Technology, Finland, announced in March, 2007, an agreement to work together on a key strategic collaboration in nanotechnology research. The two organisations work together on selecting and progressing research into this area of technology. The collaboration is also part of The Finnish national FinNano program of TEKES (the Finnish Funding Agency for Technology and Innovation).

'Morphing' into the nanosphere

Morph is a concept that demonstrates how nanotechnology might be integrated into devices within the next 10 to 15 years. It is hoped that the ideas emerging from this research will help Nokia to understand and develop the "nanoscale" to create concept mobile devices that will significantly enhance the user experience. The Morph concept includes ideas that could make mobile devices more intelligent and cost-effective, allowing them to interact with their environment in new and innovative ways using microscopic technology. For example, nanotechnology can make mobile devices flexible and stretchable, have a self-cleaning surface and will feature nanosensors that can interact with the environment to provide key information for anything from temperature changes to air pollution. It will also allow transformable mobile devices, which would allow the user to change the shape of the device. For further information, please visit www.nokia.com/A4126514

Design and the Elastic Mind: The Museum of Modern Art (MoMA) exhibition

The Morph concept showcases Nokia's nanotechnology research as part of the MoMa exhibition "Design and the Elastic Mind" launching on the 24th February and running until 2nd May, 2008. Morph will be included in the exhibition catalog and on MoMA's website www.moma.org/elasticmind

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