Nanotechnology for Communications

Re-Engineering of Matter for Breakthrough Technologies

FACT SHEET

FAST FACTS

86 U.S. issued patents

Motorola i870 phone with AgION™ antimicrobial coating first market application in 2005

First-of-its-kind, Nano Emissive Display prototype announced in 2005

Key Areas of Research

Nano Electronics
Nano Materials
Nano Energy
Nano Structures
Nano Manufacturing
Physical and Functional Characterization
Standards

Research Locations

North America
Europe
China

Recent Awards

2006 Nano 50™ Award, Nano Emissive Display technology

2005 BIRD Foundation Award, nano semi-conducting inks

2005 Scientific American 50 Award, Dr. James E. Jaskie for practical nanotubes

2002 MIT Technology Review, top 10 nanotube companies to watch

Nanotechnology creates radical new approaches to material property enhancement and synthesis and will enable new technologies, applications and industries in yet-to-be-imagined ways. A global leader in nanotechnology for communications, Motorola undertakes a variety of research and development activities with a specific focus on applications that will help us realize our vision of Seamless Mobility. The implications of our award-winning efforts are widespread. From improved phone housings to better power sources to more vibrant displays, nanotechnology is poised to make a big impact on the communications industry.

Nano Materials

Motorola is researching a variety of nano materials for applications in the communications industry. Carbon nanotubes (CNTs) are tubes of carbon atoms less than one nanometer in diameter that emit light and conduct electrons one hundred times better than copper. We have discovered a way to grow CNTs at low temperatures and created a method to precisely grow nanotubes on the surface of a material. These breakthroughs enable manufacturers to create products that can be designed and manipulated at the molecular level to enhance specific characteristics without damaging temperature-sensitive materials, such as glass. Motorola also studies the characteristics of free standing quantum dots for use in novel surface finishes and to create energy-efficient light sources.

Nano Emissive Displays (NED™)

Motorola pushed nanotechnology one step closer to the mainstream electronics market when we announced the creation of a 5-inch Nano Emissive Display prototype in May 2005. The first-of-its-kind prototype was created through a proprietary method of growing CNTs directly on glass to provide superior electron emissions that yield an energy-efficient, high-definition display. This breakthrough technology could be used to make large, flat panel displays with superior quality and longer lifetimes at significantly lower costs than current offerings. Motorola plans to license this technology to display manufacturers for full commercialization.

Housings and Surfaces

Motorola explores opportunities to use nanotechnology in our phone housings and surfaces. The Motorola i870 phone already sports an AgION™ antimicrobial coating made from silver zeolite nanoparticles. Research in the area of structural nanocomposites has promise to increase the strength of bio-based environmentally friendly housings, while a variety of nanoparticle coatings can create additional antibacterial, self-cleaning, smudge-proof surfaces with novel finishes.

Energy Sources

Energy management is critical for Seamless Mobility, so Motorola pursues research in nanoenergy that focuses on generation and storage. We are exploring fuel cell technology as a source of efficient, long-lasting power for mobile devices. Nanotechnology has the potential to improve the performance and lifetime of these fuel cells; for example, research investigating the use of CNTs as catalyst support and/or components of fuel cell electrodes is underway. This could result in increased power density, reduced system size, and reduced precious metal use — thereby reducing cost.

Nanosensors

Motorola is working on nanosensors that have the ability to detect chemical and biological agents and have implications for warning emergency first responders of hazards in the environment. They are small enough to integrate into many devices and provide extremely sensitive detection because nanotubes change their electronic properties when they come in contact with only a few molecules. Motorola and Arizona State University have recently developed a method to functionalize SWNT-FETs with peptides to selectively detect heavy metal ions, which represents an important step towards better-functioning nanosensors. The sensors can also be organized into miniature arrays for multi-analyte detection.

Passive and Active Electronic Devices

Motorola is exploring future electronic devices that work in frequency bands that are relevant to high-speed wireless communications. The unique electronic and structural properties of nanotubes and nanowires are being developed to realize passive and active devices. We have demonstrated field effect transistors (FETs) using CNTs and AC gain from a single-walled carbon nanotube common-source amplifier.

Standards and Trade Associations

Motorola chairs the Characterization and Metrology working group for the American National Standards Initiative (ANSI) Technical Advisory Group. ANSI is the U.S. representative to the global ISO Technical Committee 229 for nanotechnologies. We also participate in IEEE's initiative to develop nano-based electronics standards by leading Standard P1650™ on electrical characterization of carbon nanotubes and working on a nanoelectronics standards roadmap. Finally, Motorola leads a low temperature lead-free nano-solder initiative for the International Electronic Manufacturing Initiative (iNEMI), and we are championing an iNEMI warm assembly initiative that includes mechanically adhesive nano-hooks which could allow for solder-free assembly.

For additional information, visit: www.motorola.com/technology.

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