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Nanotechnology and Nanomaterials in the Electronics Sector

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Abstracts

Report summary

Nanomaterials are being widely applied in the electronics and computing industry, primarily arising from the need to create smaller, faster microchips and memory devices, as well as offering improved performance for displays and sensors. Application of nanotechnology in integrated circuits is leading to improvements in processor density and performance, energy efficiency and reliability. Intel is currently utilising an atomic layer deposition process to deposit high-k materials in the fabrication of 45 nm chips.

Organic light-emitting diodes (OLEDs) are also beginning to impact the market, enabling low power, flexible displays with high performance capabilities. Quantum dot displays with tunability that enables high-performance color are also close to market. Nanomaterials are also being integrated into Field Emission Displays (FED), and Surface-conductive Electron-emissive Displays (SED), which are not on the market as yet as opposed to commercially available OLED displays in portable electronic applications such as mobile phone screens and laptops.

Nanomaterials have potential to meet a wide range of memory device needs including speed, power consumption, density, reliability, non-volatility, and cost. There are a number of nanotechnology-based approaches to the development of data storage; Magnetoresistive Random Access Memory (MRAM), Ferroelectric RAM, (FeRAM), Resistive RAM (RRAM), and NRAM (Nanotube RAM). Moore's Law dictates that these current devices will inevitably rely on emerging nanotechnology, be it in materials or fabrication. Carbon nanotubes and nanocrystals are utilized for their radiation and temperature intolerance, high speed capabilities and long-term scaling potential. Companies such as Samsung and Nanosys are using nanocrystal memory to extend

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floating gate or charge trap flash memory structures.

This 172 page report from Future Markets, Inc. is the first market study produced covering the raft of applications and end products enabled by nanotechnology and nanomaterials in the electronics sector. Report contents include:

Nanomaterials development in the electronics sector utilizing the following materials:

Metal oxide nanopowders

Carbon nanotubes

Fullerenes and POSS

Graphene

Nanofibers

Nanosilver

Nanowires

Nanobuds

Quantum dots

Applications of nanomaterials in the following electronics sector sub-markets:

Coatings and films

Data storage and processing

Displays

Electronics packaging

Field emission devices

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Printable and flexible electronics

Profiles of companies developing products and applications for the electronics sector utilizing nanomaterials and nanotechnology

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TABLES & FIGURES

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in the electronics sector

Table 28: Applications, materials and companies of nanoenabled printable and flexible electronics in the electronics sector

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