Cracking the hot spot

Oki Electric Industry Co Ltd has developed RadiCool, a hybrid heat radiation material that reduces 30% of intense heat generated by electronic equipment. Developed together with Oki Electric Cable Co Ltd, RadiCool has the capability to reduce both heat radiation and heat conduction. Shipment starts from November 2004 for the electronic equipment and components market, aiming to reach sales of ¥2bn in the fiscal year ending March 2006.

RadiCool sticker, sheet type.

"Because electronic equipment is becoming smaller and lighter with sealed structures, solutions for heat are becoming more critical and important," said Harushige Sugimoto, senior VP of Oki Electric. "When RadiCool is used in electronic equipment, there is no need for conventional heat sinks or cooling fans, enabling equipment to become dramatically smaller.

Because heat loss can be controlled, RadiCool also contributes to equipment's longer life, higher performance and lower power consumption.

RadiCool is a sticker, with Cerac-a painted onto a thin beaten-copper sheet that comes in two types: the sheet-type and the ring-type.

Cerac-a is an environment-friendly, inorganic liquid ceramic paint for heat radiation, co-developed by Oki Electric and Ceramission Co Ltd. It is designed to make a 50-150μm thin coat using the ceramic to radiate heat by converting it into far infra-red radiation.

The 30% heat reduction RadiCool can achieve includes 20% from Cerac a's heat radiation and 10% from the thin beaten-copper's heat conduction. Because polyimide is used it can be easily bent or pulled, and cut with scissors, enabling it to be placed freely onto necessary surfaces.

In addition, Oki Electric Cable's technology in developing flexible printer circuits makes RadiCool only 0.2mm thin, flexible for bending and pulling.

Nanotube conductive networks

Researchers from DuPont Central Research and Development and Columbia University have devised a way to make a random, self-assembled network of carbon nano - tubes embedded in polymer, that preserves the nanotubes' electrical conductivity and is suitable for thermal printing processes.

The nanotube networks could eventually be used to make large, inexpensive electrical signs and displays, according say the scientists. The composite material consists of nanotubes, a conductive polymer that connects the nanotubes to form a highly-conductive network, and a non-conductive, or insulating polymer that forms a film, or matrix, surrounding the interconnected nanotubes.

The matrix has no impact on the electrical properties of the nanotube network, according to the researchers. The material incorporate bundles of nanotubes and could make thin-film transistors for displays. The method could be used with single nanotubes, to yield materials suitable for nanoelectronics applications like nanowires and biosensors. Organic electronic applications could be practical in two to five years, according to the scientists.

Conductive polymer interconnects

Dow Corning Corp has signed a joint development contract with Invint Ltd, a conductive polymer interconnect technology specialist. Under the contract, Invint will develop and characterise novel interconnect processes, based on new Dow Corning conductive polymer products, including both organic-and silicon-based materials.

Conductive polymer materials are increasingly being used in a wide range of interconnect applications, from cell phones and smart cards to military and automotive electronics.

The conductive polymer market is expected to see significant growth over the next few years, with demand in the US alone increasing 5.9% annually to become a $4.5bn market in 2008, according to market researchers, The Freedonia Group.

"When developing new products, we're also looking at the integration and process challenges customers will face when adopting a new material," said Tom Cook Dow Corning's global industry exec. director.

E-paper application as e-sign

BASF Future Business GmbH, Ludwigshafen and SiPix Technology Inc, Taipei, Taiwan, have a partnership to jointly develop coloured e-paper applications. BASF will develop the dyes needed to produce multicolored displays that can be used as electronic price and advertising signs, books, newspapers or magazines. At the same time, BASF Future Business will acquire a stake in SiPix and will participate in the economic success of electronic media.

E-signs are one of the first e-paper applications planned for market launch. They constitute an electronic alternative to the paper labels that supermarkets use on shelves, for example to show product prices.

E signs consist of an electronic display panel, an energy source and a receiver that is radio-controlled via a central computer. These electronic signs have the advantage that they do not have to be changed by hand and labeled. They can be read from any angle, require only a small amount of energy and have a life of up to six years.

"We estimate that e-paper applications will reach a market potential of €500m in the next 10 years," said Markus Kropp, business manager at BASF Future Business. "We see e-signs as a way of entering the promising market of e-paper applications such as electronic newspapers and magazines, e-books and smart cards, or chip cards with additional electronic functions. By cooperating with SiPix we are also strengthening our activities in the fast growing electronics sector."

Graphene nudges GaAs

The University of Manchester researchers, and from Chernogolovka, Russia have discovered the world's first single-atom-thick fabric, a new class of materials and may lead to computers made from a single molecule. Led by Professor Andre Geim at The University of Manchester, the team has succeeded in extracting individual planes of carbon atoms from graphite crystals, which has resulted in the production of the thinnest possible fabric - graphene.

The resulting atomic sheet is stable, highly flexible, strong and remarkably conductive. It belongs to the family of fullerene molecules, but is the first two-dimensional fullerene.

The researchers concentrated on the electronic properties of carbon nanofabric. By employing the standard microfabrication techniques they demonstrated an ambipolar field-effect transistor, which works under ambient conditions

The nanofabric exhibits a remarkable quality so that electrons can travel without any scattering over submicron distances, important for making very-fast-switching transistors.

Professor Geim says: "Carbon nanotubes are basically made from rolled-up narrow stripes of graphene, any of the thousands of applications currently considered for nanotubes renowned for their unique properties can also apply to graphene itself."

Although the researchers are currently dealing with patches of graphene about ten microns across, Geim says: "Engineers will need graphene wafers a few inches in size, before considering graphene as "the next big thing." However, all the omens are good, as there are "no fundamental limitations on the lateral size of carbon nanofabric."

David Glover from University of Manchester Intellectual Property Ltd commented: "This is clearly an exciting breakthrough with huge potential, and with development graphene could compete in some of the niche markets where gallium arsenide presently rules, due to graphene's low energy consumption and high electron mobility."

Danish Float Zone silicon gets US distributor

Silicon Quest International (SQI) and Danish-based Topsil Semiconductor Materials have signed an agreement for sole US distribution of Topsil Float Zone products, ranging from gas phase doped products to neutron irradiated products.

As the power electronics market demand has steadily increased over the past few years, driven by the need for better energy management, there is believed to be a growing need for Float Zone silicon in the US.

The detector and communication market also benefits from the highest purity silicon which supports new applications with higher speed and larger integration. In order to improve Topsil's ability to serve the new markets, SQI has been selected to distribute Topsil product throughout the US.

US-based customers can contact SQI for the following products, including:

• Premium Float Zone Silicon (PFZ) and Neutron Transmutation Doped Silicon: primarily for power and detector applications. PFZ silicon is available in 100-150mm diameters, with up to 5,000ohm-cm in bulk resistivity.

•NTD is available in 50-150mm diameters, up to 5,000 ohm-cm. HiRes silicon, the ideal wafer for emerging GHz applications, low loss microwave and millimeter wave components. Available in 100-150 mm diameters, starting from 8,000 ohm-cm.

•High Purity Silicon, silicon wafers for low noise radiation and photonic detectors. Available in 100-150 mm diameters starting at 2,000 ohm-cm and upwards.

"Our 13+ year experience distributing silicon wafers in the US, in addition to our in-house production and marketing expertise, makes us the perfect fit as a Topsil partner," says SQI president, Richard Mee.