Jet System Prints Cabon Nanotube Transistors

ALBUQUERQUE, N.M.--(BUSINESS WIRE)--Optomec announced today that its Aerosol Jet system has been used to fully print Carbon NanoTube (CNT) based Thin Film Transistors (TFT) with operating frequencies over 5 GHz. The work was conducted in collaboration with the University of Massachusetts and Brewer Science. The results were recently published in APPLIED PHYSICS LETTERS (93, 243301 2008) with a paper titled "All [aerosol] jet-printed carbon nanotube thin-film transistor on a polyimide substrate with an ultrahigh operating frequency of over 5 GHz."

Printing TFTs on flexible substrates at room temperature offers a cost-effective way to achieve mass production of large-area electronic circuits without using special lithography equipment. This is important for many emerging applications such as flexible displays, RFID tags, electronic paper, and smart skins. The Aerosol Jet deposition process was used to completely print all four layers of the Thin Film Transistor including materials with a wide spectrum of viscosities, making it an ideal solution for this type of multi-layer device.

The paper states that "Printed flexible electronics have been reported by using various organic semiconducting polymers. However, the carrier mobility of organic semiconducting polymers is still less than 1.5 cm² V s, which limits the device operation speed to only a few kilohertz. Carbon nanotube (CNT), a material with exceptional aspect ratio and great mechanical flexibility, has shown great promises as an active carrier transport material in making high-speed flexible field-effect transistors (FETs). All the

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elements of the TFT are fabricated solely by using Aerosol Jet printing technology without involving any photolithography fabrication steps. An ultrahigh operating frequency of over 5 GHz was demonstrated with an on-off ratio of over 100." To read the full text of the paper, click here (http://www.optomec.com/registration/reg _form?fileid=UML_MEM_Carbon_Nanotube _Paper.pdf [1]).

Dr. Mike Renn (a co-author of the paper) states that "One of the unique benefits of the Aerosol Jet technology is that it is capable of printing TFT devices with high drain current, high on-off ratio, and low operation voltage. Additionally, Aerosol Jet systems have achieved sub-micron layer thicknesses, and less than 10 micron features sizes and 5 micron registrations."

Optomec's Aerosol Jet systems are used in the development of next-generation printable devices, such as solar cells, fuel cells, embedded sensors, and more. Aerosol Jet systems use a patented process that first aerosolizes conductive and nonconductive inks or pastes and then forms an aerodynamically focused droplet stream of the material. This Direct Write capability eliminates the need for screens or stencils required by traditional contact deposition processes while also enabling much finer feature sizes than is possible with ink jet printing technology.

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