News Highlights for IEEE's International Electron Devices Meeting

Most transistors are made from silicon, but two papers selected as late-news presentations for the upcoming IEEE International Electron Devices Meeting (IEDM) will detail record-breaking performance in transistors made from a different material: carbon.

The 57th annual IEDM will take place at the Hilton Washington Hotel from December 5-7, 2011, preceded by a day of Short Courses on Sunday, Dec. 4. Also, on Saturday, Dec. 3 the IEDM will offer 90-minute tutorial sessions aimed at recent graduates, young professionals and those looking to broaden their understanding of technical disciplines.

Many of the world’s leading microelectronics scientists and engineers from industry, academia and government will gather at the IEDM to enjoy a technical program of some 220 presentations. These presentations, along with panel discussions, special sessions, short courses and other events, spotlight more leading work in more areas of the field than any other conference. They include silicon and non-silicon device and process technology, molecular electronics, nanotechnology, optoelectronics, MEMS/NEMS (micro-/nanoelectromechanical systems), energy-related devices and bioelectronics.

Here are descriptions of two late-news papers to be given at the 2011 IEDM:

280-GHz Transistors Made From Synthesized Graphene: An IBM paper will describe record radio-frequency (RF) performance from transistors made from synthesized graphene. Graphene is a one-atom-thick sheet of carbon atoms with an exceptional set of properties that give it great potential for electronics applications. Researchers worldwide are racing to develop graphene devices and circuits with commercial potential, and the IBM work represents a significant step toward that goal. Synthesized graphene is attractive for future mass-production due to its potential for wafer-level processing. The IBM team demonstrated a 280-GHz cut-off frequency in a 40-nm gate-length FET, the fastest ever reported from synthesized graphene. They also achieved record high output current (5 mA/μm) and transconductance (2 mS/μm) in synthesized graphene FETs (albeit with longer gate lengths), and explored the impact of gate dielectric selection. These devices also demonstrated an appreciable RF voltage gain of 10 dB, demonstrating the potential of these devices for conventional circuit applications. (Paper #23.8, “Record High RF Performance for Epitaxial Graphene Transistors,” Y.Q. Yu et al, IBM)

Sub-10-nm Carbon Nanotube Transistors Beat Theoretical Predictions: Another late-news paper from IBM outlines the first experimental demonstration of sub-10-nm transistors made from carbon nanotubes (CNTs). The CNT-based transistors not only demonstrated better current-drive performance than conventional silicon devices

under similar bias conditions, they performed better than theory predicts they should have. Researchers are searching for a replacement for silicon because it isn't seen as viable for ultra-scaled transistors. Single-walled CNTs, which can be thought of as graphene rolled into a tube, are a possible replacement but it hasn't been clear that sub-10-nm gate length CNT-based transistors can avoid short-channel effects that degrade performance. The IBM researchers will show that such aggressively-scaled CNT-based transistors are, in fact, feasible. They built devices that achieved more than four times the current density (2.41 mA/μm) of the best competing silicon device, at a low operating voltage of 0.5 V. This suggests they are suitable as the basis of a future low-power, high-performance logic technology. The researchers speculate that theoretical predictions were exceeded because the transistor gate modulates the charge not only in the channel but in the contact regions as well, which had not been considered previously. (Paper #23.7, "Sub-10-nm Carbon Nanotube Transistor," A. Franklin et al, IBM)

Further information
Additional news releases describing the 2011 IEDM, as well as conference and registration information, are available at www.ieee-iedm.org. Or contact:

Phyllis Mahoney, Conference Manager telephone (301) 527-0900
Widerkehr & Associates fax: (301) 527-0994
19803 Laurel Valley Place e-mail: iedm@his.com [1]
Montgomery Village, MD 20886

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