Nanomanufacturing Sciences

October 2012 – Monthly Newsletter

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DIRECTOR'S MESSAGE

Selection of projects from the recent Cross-Disciplinary Semiconductor Research (CSR) solicitation has been completed by the ETAB, and four of the awarded grants will be incorporated into the 2013 NMS portfolio. A research project led by Christof Teuscher (Portland State) on "3D FPGA Cell Matrix by Self-Assembly" will be included in the Patterning Thrust and three additional projects will be included in the NEM Thrust: (1) "Two Molecules Per Bit-Molecular – Level Manipulation of Electric Polarization for Data Storage and Processing" led by Axel Enders (U. Nebraska/Lincoln), (2) "Semiconductor Nanowire Networks for Thermoelectric On-chip Cooling and Power Generation" led by Nobuhiko Kobayashi (UC/Santa Cruz), and (3) "Strain Engineered Hi-k Hafnium Oxide Ferroelectric Thin Films Towards Multi-functional Sensor/Logic/Actuator/Memory (SLAM) Nodes" led by Toshikazu Nishida (U. Florida).

With respect to progress this month in the NEM Thrust, Prof. Thompson's group has demonstrated that external bias can be used to achieve better control of the properties of Si nanowires and the etch rate of silicon. In the metrology area, Prof. Murnane's efforts have been focused on the enhancement of EUV photoacoustic nanometrology precision on low-k films in the 50-100nm range and developing finite element simulations to numerically describe the response of such films. In parallel, the sensitivity of the technique is being evaluated with a series of multilayered nanostructures with < 1nm thickness increments. Meanwhile, the close interaction of Prof. Barmak's group with industrial liaisons continues with measurements on a variety of W and Cu samples provided by member companies. Forward modeling of resistivity data for Cu/SiO2 and Cu/Ta/SiO2 samples with the aim of providing confidence intervals on sidewall specularity and grain boundary reflectance while accounting for the twin boundaries is nearly completed for 5 of the 9 models presented in their 2010 paper. The group has received requests to provide their Mathematica codes for the above mentioned models to the industrial liaisons and will do so once the statistical analysis has been completed and codes have been commented to be user friendly. Prof. Kelber has engaged in collaborative efforts with groups at NRL (Jonker) and UIUC (Pop) to fabricate actual devices that demonstrate spin-polarized transport and spin filtering at room temperature. NEM is providing small supplemental funding to support this work.

The Patterning Thrust held its annual review at the University of Chicago (thanks to Professors Nealey and de Pablo—our hosts) on September 25th and 26th. Highlights included block co-polymer directed self-assembly yield results on 300 mm wafers from the Nealey group in collaboration with IMEC, the dynamics of directed self-assembly via solvent annealing captured in 3-dimensional models by the de Pablo group, and preliminary evidence from the Ross group showed that self-assembly can be achieved in as little as thirty seconds using a solvothermal anneal process in conjunction with e-beam templating. These presentations and others can be found at http://www.src.org/calendar/e004800/#tab-publications.

Best regards,

Bob, Boyan and Shawna

Currently this NMS Sciences Monthly Newsletter is being sent to SACC and TAB members plus all liaisons, i.e., people already involved in SRC activities. If you would like to suggest names added to the mailing list to generate new interest, please let us know. (All monthly newsletters will be archived on our web-site: http://www.src.org/program/grc/NMS/newsletter/)

For news regarding all other GRC Science Areas, please reference the following links
CADTS = http://www.src.org/program/grc/cadts/newsletter/

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NEW NMS TASKS

Contract	Curr Fund Source	Title	Start Date	End Date	PI	University
			NEM			
2012-OJ-2358G	GRC Core	Graphene Direct Growth on Oxides for Transport Measurements and Device Applications	10/1/2012	9/30/2013	Jeffry Kelber	Univ. of N. Texas

RESEARCH REPORT HIGHLIGHTS

Report ID	Task	Thrust	Task Title	Univ	Leader	Highlight
P064604	1873.001	Nanoengineered Materials	Report on the Characterization the Morphological and Structural Performance of the Hybrid TCFs, and Simple Film Adhesion Studies	UT-Austin	Rodney Ruoff	Hybrid transparent conductive films were produced by separately optimizing deposition conditions for graphene oxide and Cu nanowires. Uniform TCFs were fabricated by stacking sheets of G-O and Cu NWs with a dry transfer technique and hydrazine reduction.

UPCOMING EVENTS

Date	Event Summary
16 October 2012	Kickoff Presentation for New Patterning Task Research Triangle Park, NC, United States Professor Alain Diebold (Albany-SUNY) will provide a brief overview of his new research task 2337.001 in the Patterning thrust/Metrology cross-cut.
29 November 2012	Metrology e-Workshop: Katayun Barmack (CMU) ***E-Workshop*** Research Triangle Park, NC, United States Professor Barmack will discuss her task 2121.001 High Throughput Electron and X-ray Diffraction Based Metrology of Nanocrystalline Materials