2:30PM H53.00001 Pushing the lipid envelope: using bio-inspired nanocomposites to understand and exploit lipid membrane limitations GABRIEL MONTANO, Los Alamos National Laboratory — Lipids serve as the organizing matrix material for biological membranes, the site of interaction of cells with the external environment. As such, lipids play a critical role in structure/function relationships of an extraordinary number of critical biological processes. In this talk, we will look at bio-inspired membrane assemblies to better understand the roles of lipids in biological systems as well as attempt to generate materials that can mimic and potentially advance upon biological membrane processes. First, we will investigate the response of lipids to adverse conditions. In particular, I will present data that demonstrates the response of lipids to harsh conditions and how such responses can be exploited to generate nanocomposite rearrangements. I will also show the effect of adding the endotoxin lipopolysaccharide (LPS) to lipid bilayer assemblies and describe implications on our understanding of LPS organization in biological systems as well as describe induced lipid modifications that can be exploited to organize membrane composites with precise, two-dimensional geometric control. Lastly, I will describe the use of amphiphilic block copolymers to create membrane nanocomposites capable of mimicking biological systems. In particular, I will describe the use of our polymer-based membranes in creating artificial photosynthetic assemblies that rival biological systems in function in a more dynamic matrix.

3:06PM H53.00002 Expanding the versatility of silicon carbide thin films and nanowires1, LUNET LUNA, Univ of California - Berkeley — Silicon carbide (SiC) based electronics and sensors hold promise for pushing past the limits of current technology to achieve small, durable devices that can function in high-temperature, high-voltage, corrosive, and biological environments. SiC is an ideal material for such conditions due to its high mechanical strength, excellent chemical stability, and its biocompatibility. Consequently, SiC thin films and nanowires have attracted interest in applications such as micro- and nano-electromechanical systems, biological sensors, field effect transistors, and energy storage devices. However, to fully realize SiC in such technologies, the reliability of metal contacts to SiC at high temperatures must be improved and the nanowire growth mechanism must be understood to enable strict control of nanowire crystal structure and orientation. Here, we present a novel metallization scheme, utilizing solid-state graphitization of SiC, to improve the long-term reliability of Pt/Ti contacts to polycrystalline n-type SiC films at high temperature. The metallization scheme includes an alumina protection layer and exhibits low, stable contact resistivity even after long-term (500 hr) testing in air at 450 °C. We also report the crystal structure and growth mechanism of Ni-assisted silicon carbide nanowires using single-source precursor, methyltrichlorosilane. The effects of growth parameters, such as substrate and temperature, on the structure and morphology of the resulting nanowires will also be presented. Overall, this study provides new insights towards the realization of novel SiC technologies, enabled by advanced electron microscopy techniques located in the user facilities at the Molecular Foundry in Berkeley, California.

3:42PM H53.00003 Graphene Oxide/ Ruthenium Oxide Composites for Supercapacitors Electrodes1, FATIMA AMIR, Winthrop University — Supercapacitors are electrical energy storage devices with high power density, high rate capability, low maintenance cost, and long life cycle. They complement or replace batteries in harvesting applications when high power delivery is needed. An important improvement in performance of supercapacitors has been achieved through recent advances in the development of new nanostructured materials. Here we will discuss the fabrication of graphene oxide/ ruthenium oxide supercapacitors electrodes including electrochemical deposition. The morphology and structure of the fabricated electrodes were investigated and will be discussed. The electrochemical properties were determined using cyclic voltmetry and galvanostatic charge/discharge techniques and the experiments that demonstrate the excellent capacitive properties of the obtained supercapacitors will also be discussed. The fabrication and characterization of the samples were performed at the Center of Functional Nanomaterials at Brookhaven National Lab. The developed approaches in our study represent an exciting direction for designing the next generation of energy storage devices.

4:18PM H53.00004 Pushing the limits of nanolithography outside the box1, LEONIDAS OCOLA, Argonne Natl Lab — The Center for Nanoscale Materials (CNM) at Argonne National Laboratory was constructed in 2006, and opened its doors to serve the user community in 2007 with the objective to provide research opportunities in Nanoscience for the scientific community worldwide. Currently, the CNM hosts over 400 user proposals a year. There are six research groups at the CNM that do work in nanophotonics, electronic and magnetic materials and devices, nanobiophotonic interfaces, nanofabrication and devices, x-ray nanoscale microscopy and theory and modeling. At the CNM Nanofabrication and Devices Group we have been able to push the limits of electron beam lithography to make plasmonic nanostructures obtain sharp corners with less than 6 nm radius of curvature and expand the use of ion beams to 3D large area nanofabrication in microfluidics by novel design methodologies, among other accomplishments. None of these accomplishments are possible without detailed understanding of the physics and chemistry mechanisms involved during fabrication. During my talk I will discuss a few clear cases where lithography and fabrication are used in ways not commonly found in current nanofabrication facilities and what make our facility unique.

4:54PM H53.00005 The USER: Utilizing Scientific Environments for Research1, LAKEISHA WALKER, Oak Ridge National Lab — A lot of hard work goes into submitting a proposal for access to equipment in our nation’s top science research facilities. It seems the biggest focus for a facility USER should be on the acceptance of the proposal, however, the job of a facility USER actually begins after the acceptance letter arrives. In order to make the most of the awarded experiment time and cultivate collaborations for the future, facility USERS need to look beyond the proposal. From experiment scheduling to arrival to data analysis the entire USER experience is valuable and worth doing well. This presentation will discuss best practices for facility USERS and highlight successful USER collaborations at ORNL’s High Flux Isotope Reactor.

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