10000 of ultra sensitive MEMS/NEMS are achieved at low temperatures and ultra high vacuum. For sensing applications, especially biological ones, it is necessary to work under ambient conditions or even in liquids. In this work we will demonstrate MEMS/NEMS resonators which are driven by a magneto-motive actuation under ambient conditions. We describe the fabrication of AlN and SiC micro- and nanoelectromechanical resonators of different design. We have analyzed resonators with fundamental mechanical resonant frequencies between 2 kHz and 2 MHz and quality factors in excess of 30000 in vacuum and 350 in air. Finally, results of sensitivity experiments and examples of biological and chemical sensor applications are presented.

2:45 PM Invited
Zinc Oxide Thin Films and Nanostructures: Physical Vapor Synthesis and Integration into Flexible Electronics Platforms: *Renato Camata*[1]; Masashi Matsumura[1]; Mevlut Bulut[1]; Jonathan Williams[1]; [1]University of Alabama, Birmingham

Zinc Oxide (ZnO) is a multifunctional material with a suite of desirable properties. Its wide direct bandgap and large exciton binding energy make it attractive for UV LEDs, lasers, and sensors. Nanostructures exhibiting strong piezoelectricity have great potential for applications in biosensors and nanoactuators. Biologically safe, polycrystalline films with good crystal quality, ductility, and moderate Hall mobilities, can be grown at low temperatures, making it compatible with low-cost and flexible substrates. ZnO is also a promising host for metal ions that can act as optical centers in the mid-infrared. In this talk we show how we have used Nanoparticle Beam Pulsed Laser Deposition, a novel technique, to produce nanostructured ZnO films that are integrated with flexible polyimide substrates. We discuss the challenges involved in the synthesis of ZnO uniformly doped with transition metal ions in relation to other II-VI semiconductors (e.g., ZnSe) and their application in tunable mid-infrared laser sources.

3:20 PM
ZnO Based Diluted Magnetic Semiconductors and Spin Polarized Injection into ZnO: *Shivaraman Ramachandran*[1]; John Prater[1]; Jagdish Narayan[1]; [1]North Carolina State University

Here we will discuss the various aspects of diluted magnetic semiconductor thin film growth and characterization. ZnO based DMS materials have gained attention in the last few years as the possibility of realizing room temperature ferromagnetism has been realized with consistency in Co-ZnO and Mn-ZnO. In addition, we have been able to tune the ferromagnetism in these systems as a function of carrier concentration. We have done extensive characterization on these films including magnetic, microstrucural, electronic and optical properties. From these experiments, we have been able to deduce the mechanism causing magnetic ordering in these materials. We will also discuss spin polarized injection into semiconductors using these DMS materials by making device heterostructures which would ultimately help in realizing novel functional devices like spin transistors and other spintronic devices.

3:50 PM Break

4:20 PM
Electrical and Optical Properties of Ga Doped ZnO Thin Films Grown Using PLD: *Michael Snure*[1]; Minseo Park[2]; Ashutosh Tiwari[1]; [1]University of Utah; [2]Auburn University

Transparent conducting oxides (TCO) have recently gained much attention due to a number of exciting applications. ZnO has shown to be one of the most promising materials for use in TCOs because of its attractive optical and electronic properties, which are greatly enhanced when dimensions are reduced to the nanometer scale. Here, we report on a systematic study of the optical and electrical properties of Znx-1GaxO, x = 0,…,5 atomic %, thin films grown using pulse laser deposition (PLD). These films that were grown on c-plane sapphire substrates are highly transparent in the visible spectrum and show a decrease in resistance with the addition of Ga dopent. Work has also been done to see how nitrogen annealing effects the optical and electronic properties of these films.

4:45 PM
One-Dimensional ZnO Nanostructures for Dye-Sensitized Solar Cell Application: *An-Jen Cheng*[1]; William Ward[1]; Dake Wang[1]; Curtis Shannon[1]; Minseo Park[1]; Yonhua Tzeng[1]; Wonwoo Lee[2]; [1]Auburn University; [2]University of Alabama, Birmingham

One-dimensional (1-D) zinc oxide (ZnO) is a wide band gap semiconductor, and has been considered as an excellent semiconducting metal oxide material for dye-sensitized solar cell (DSSC) application. The nanostructures provide large surface-to-volume ratio and can also supply more efficient direct path for electrons from the dye to the conducting electrode. The ZnO samples were produced via thermal chemical vapor deposition (thermal-CVD) and a variety of ZnO nanostructures were synthesized by adjusting the processing parameters during the growth process. The ZnO samples were successfully synthesized at a relatively low growth temperature (>500°C) on an indium tin oxide (ITO) coated glass substrate. The light harvesting capability and overall efficiency can be greatly enhanced by using 1-D ZnO nanostructures (such as dendritic structures). The electrical characteristics of the DSSC is now being investigated.

5:10 PM
Effect of Annealing and Growth Conditions on Electrical, Magnetic and Magnetoresistance Properties of Manganite Thin Films: *Nori Sudhakar*[1]; V. Bhosle[1]; G. Trichy[1]; Jagdish Narayan[1]; [1]North Carolina State University

Manganites have emerged as one of the widely studied materials belonging to the important class of transitions metal oxides having perovskite structure. The physical properties of manganese oxide are highly sensitive to the growth conditions such as oxygen stoichiometry, choice of the substrate, growth temperature and growth time. Here we present a detailed study of structural, electrical transport and magnetic properties of the epitaxial thin films of cubic manganite system $La_{0.67}Ca_{0.33}MnO_3$ grown on MgO (100) single crystal substrates. Several films were grown at different oxygen partial pressures at 700°C using pulsed laser deposition technique. Temperature dependence of electrical resistivity shows a sharp metal-insulator transition (MIT) typical of manganites. For the as-deposited film the transition occurs at about 62 K and annealing the film in oxygen increased the transition temperature to 210 K. The values are compared to the bulk T_p value. The magnetic measurements corroborate and complement the transport data.

5:35 PM
Characterization of Nanostructure ZnO Thin Film Grown by Pulsed Laser Deposition: *Wonwoo Lee*[1]; [1]University of Alabama at Birmingham

Zinc Oxide (ZnO) is one of promising wide bandgap semiconductor materials because of their unique and novel applications in laser, piezoelectricity, and optoelectronics. Nanostructure ZnO thin film on Si substrate was grown by pulsed laser deposition (PLD) for solar cell application. X-ray diffraction spectroscopy is used to confirm the crystalline orientation of nanostructure ZnO thin film. Optical properties are also investigated using by photoluminescence (PL). A strong PL peak located at 374 nm is attributed to the free-exciton recombination, while a broad emission peak near at 2.8 eV may be corresponded to the defect level, such as zinc vacancy, oxygen vacancy, or interstitials. Electron paramagnetic resonance spectroscopy (EPR) is used as supplementary tool to support the defects of nanostructure ZnO thin film as shown in PL measurements. The vibrational properties of the nanostructure ZnO films are investigated by Raman scattering spectroscopy.