ASM International
The Materials Information Society
Hartford Chapter

Student Night Presentations – March 8, 2005

Speaker: Chandrasekhar Kothapalli
Advisor: Dr. Mei Wei & Prof. Montgomery Shaw
Bio: Graduated in 2000 with B.Tech in Chemical engineering from Andhra University, India. Finished Masters in Chemical Engg from Mississippi State University in 2002 and currently doing Ph.D at University of Connecticut specializing in Biomaterials.

Topic:
Influence of temperature and concentration on the sintering behavior and mechanical properties of hydroxyapatite.

Abstract:
Human bone mineral contains calcium-deficient crystalline hydroxyapatite (HA) embedded in collagen fibers. Research over the past two decades has focused on preparing synthetic HA, which closely resembles bone apatite and exhibits excellent osteoconductivity. This paper describes the synthesis of nano-hydroxyapatite particles via a wet precipitation method. The concentration of the reactants and the temperature of the reaction were varied. The length and breadth of the HA particles were found to increase with the temperature, while the aspect ratio increased with both the concentration and the temperature. The average length of the particles was in the range 53-165 nm and the average breadth in the range of 29-52 nm. A maximum strength of 57.4 MPa was observed for the specimens 2.0-70 which also attained the highest density, 92%.

Speaker: Burc Misirlioglu
Advisor: S. Pamir Alpay
Bio: Burc Misirlioglu got his B.S. and M.S. degrees in Metallurgical Engineering from Istanbul Technical University. He is currently enrolled as a Ph.D. student at the University of Connecticut in the Department of Materials Science&Engineering. His research is on the effects of defects such as dislocations on the properties of ferroelectric thin films and is also conducting research on PLD growth of ferroelectric thin films to study structural characteristics of phase transformations in ferroelectric thin films.

Topic: A Challenge Awaiting Nanoscale Device Engineering: Supression of Ferroelectricity in Ultrathin Epitaxial Thin Films

Abstract:
Dislocations are the most common type of secondary defects and are unavoidably present in all crystalline materials. They have been observed in ferroelectric materials as in many other materials systems. Ferroelectrics have gained great interest due to their special properties such as spontaneous polarization, electric field dependent high dielectric constant and pyroresponse. When in ferroelectric films, dislocations severely effect the physical properties of the films designed for various applications confirmed by several experimental studies. In this study, we supply experimental and theoretical evidence to explain why they may have a significant impact on the degradation of the electrical properties and change the phase transformation characteristics in epitaxial ferroelectric thin films.

Speaker: Jason S Tresback
Advisor: Nitin Padture
Bio: Working Jason Tresback received his B.S in Chemistry from the UniversityMassachusetts, Amherst, in 2002. He also satisfied the requirements for a minor in Physics. His undergraduate research areas include organic synthesis and nanotechnology. He began the M.S in MS&E during the summer of 2003 and has been working on the synthesis and characterization of multi-layered nanowires under Dr. Nitin Padture's guidance. He plans to begin the PhD at The Ohio State University, Columbus, in fall 2005, upon successful completion of the M.S.

Topic: Synthesis and Characterization Of Engineered Metal-Oxide-Metal nanowires

Abstract:
There has been growing interest in the "bottom up" approach to building nanoelectronic devices, where nanoscale building blocks, such as nanowires (metals, semiconductors, oxides), are fabricated in isolation and assembled into nanocircuits. The "bottom up" approach offers several key advantages over the conventional "top down" microelectronics approach, including higher circuit densities and processing compatibility. Current nanoelectronics technology uses nanowires that are assembled across photo-lithographically deposited metal contact-pad electrodes to create devices. In this case, the length of the nanowire spanning the electrodes defines the active region, which is very difficult to control precisely. In order to address this critical issue, we propose the concept of the engineered metal—oxide—metal (MOM) nanowire, which is a metal nanowire (50 to 100 nm diameter; Au or Pt) with a small segment (50-100 nm length) being replaced by a functional oxide. In other words, a MOM nanowire has a functional oxide of precise dimensions with metal interconnects integrated within the building block. The functional oxide can be a sensor, ferroelectric, dielectric, semiconductor, or magnetic material. Thus, the MOM nanowires have the potential to take the field of "bottom up" nanoelectronics to the next level of sophistication and control. We have used two different methods of electrochemical deposition within porous templates to synthesize such MOM nanowires. Both methods are generic, and they can be used to fabricate a wide variety of MOM nanowires. We have synthesized one example of a MOM nanowire consisting of Au—SnO_2 —Au segments (gas sensor). Synthesis methods, characterization results from the MOM nanowires, and the assembly of the nanowires into functional nanodevices will be discussed.

MATERIAL ADVANTAGE
The ACerS-ASM-TMS Student Program
Everything Else Is Immaterial

Competition Poster Session:

Posters will be displayed in meeting room at Zenny's

Electrolyte Proton-Conductive Materials For Protonic Ceramic Fuel Cells (PCFCs)
S.Higgins, N.Sammes, and A.Smirnova

Enhancing the Performance of Polymer-Based Bipolar Plates via Novel Microstructure Design
Man Wu, Leon Shaw

Characterization of carbides and borides in Ni-base Superalloy IN100
Kai Song, Mark Aindow

Abnormal Grain Growth in Ni-base Superalloy IN100
Kai Song, Mark Aindow

Life Prediction of EB-PVD Thermal Barrier Coatings based on Measurement of Three Parameters
Mei Wen, Eric Jordan and Maurice Gell

Controlled Defect Insertion in 2-D Photonic Crystal Using Nd:YAG Pulsed Laser Harmonic at 532nm
Phillip Yu, Sejong Kim, Erik Geiss, Harris Marcus, Fotios Papadimitrakopoulos

Dielectric permittivity and pyroelectric response of compositionally graded ferroelectrics
Shan Zhong, Pamir Alpay