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founded in 1931

Nancy Ryan Gray, Ph.D.
Director

2006 GORDON RESEARCH CONFERENCE
on
CERAMICS, SOLID STATE STUDES IN

FINAL PROGRESS REPORT
OFFICE OF NAVAL RESEARCH
GRANT NO. N00014-06-1-0141

The Gordon Research Conference (GRC) on CERAMICS, SOLID STATE STUDIES IN was held at Proctor Academy from 8/13/2006 thru 8/18/2006. The Conference was well-attended with 101 participants (attendees list attached). The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both U.S. and foreign scientists, senior researchers, young investigators, and students.

In designing the formal speakers program, emphasis was placed on current unpublished research and discussion of the future target areas in this field. There was a conscious effort to stimulate lively discussion about the key issues in the field today. Time for formal presentations was limited in the interest of group discussions. In order that more scientists could communicate their most recent results, poster presentation time was scheduled. Attached is a copy of the formal schedule and speaker program and the poster program. In addition to these formal interactions, "free time" was scheduled to allow informal discussions. Such discussions are fostering new collaborations and joint efforts in the field.

I want to personally thank you for your support of this Conference. As you know, in the interest of promoting the presentation of unpublished and frontier-breaking research, Gordon Research Conferences does not permit publication of meeting proceedings. If you wish any further details, please feel free to contact me. Thank you.

Sincerely,
JOHN E BLENDELL
PURDUE UNIVERSITY

Ceramics, Solid State Studies In

Optimization of Performance through Microstructural Design

August 13-18, 2006
Proctor Academy
Andover, NH

Chair: **John E Blendell**
Vice Chair: **Robert F Cook**

Overview

The Gordon Research Conference on Solid State Studies in Ceramics, August 13th to 18th, 2005 will focus on the Optimization of Properties through Microstructure Design. While one of the basic principles of Ceramic Science has been that the properties and performance of ceramic materials can be manipulated through control of the microstructure, the ability to predict the performance of specific microstructures remains limited. A more critical problem is that the ability to design a realistic microstructure which will optimize the performance of a material is virtually nonexistent. With the recent interest in thin film applications and nanostructured materials, question naturally emerge of how their microstructures can be modified for these systems and the relationship of specific microstructural details to the properties have taken on an important role. In addition, recent research has shown that there are local measures of the microstructure which may strongly correlate with the properties but which are difficult or not usually measured. These local measures are the next step in microstructure characterization beyond the standard metrics such as grain size and grain size distribution; crystallographic texture, phase content and phase distribution; and porosity, pore size and pore location. For example, the grain boundary character distribution which gives a measure of the energy of the grain boundaries formed and pair correlation functions which yield information on the local grain texture both have potential to extend our understanding of the interaction of microstructure and properties and offer directions for processing research to control these metrics. Another advance is in understanding the distribution of second phases at interfaces where critical wetting models, surface adsorption and partial wetting all have been shown to occur, but the design of microstructures using these models has not yet been accomplished. In order to address these issues, this conference will bring together a wide range of researchers who are developing modeling techniques to understand how the microstructure develops, researchers who are producing new and unique microstructures, and researchers who are measuring the properties of these advanced materials with the goal of being able to design unique microstructures which will led to optimum properties.

SUNDAY	
2:00 pm - 11:00 pm	Arrival and Check-in
6:00 pm	Dinner
7:30 pm - 7:40 pm	Welcome / Introductory Comments
7:40 pm - 9:30 pm	**Modeling and Simulation of Grain Growth**
	Discussion Leader: **Catherine Bishop** (Oxford Univ, Oxford UK)
7:40 pm - 8:20 pm	**James Warren** (NIST, Gaithersburg MD) "Phase Field Modeling of Polycrystals"
8:20 pm - 8:35 pm	Discussion
8:35 pm - 9:15 pm	**Veena Tikare** (Sandia National Lab., Albuquerque NM) "Statical-Mechanical Modeling of Microstructure Evolution"
9:15 pm - 9:30 pm	Discussion
MONDAY	
7:30 am - 8:30 am	Breakfast
8:30 am	Group Photo
9:00 am - 12:30 pm	**Computational Design of Microstructure**

	Discussion Leader: **W. Craig Carter** (MIT, Cambridge MA)
9:00 am - 10:00 am	**David Wu** (Yale Univ. New Haven CT) "Statistical Grain Growth Laws for Modeling the Coarsening of Microstructures"
10:00 am - 10:30 am	Discussion
10:30 am	Coffee Break
11:00 am - 12:00 pm	**R. Edwin García** (Purdue U. West Lafayette IN) "Microstructure Design of Electrically Active Materials"
12:00 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 6:00 pm	Free Time
6:00 pm	Dinner
7:30 pm - 8:30 pm	**Continuation of Rowland Cannon's Research**
	Discussion Leader: **Randy Hay** (Air Force Research Lab., Dayton OH)
7:30 pm - 7:45 pm	**W. Craig Carter** (MIT, Cambridge MA) "Everything about Interfaces and in Between"
7:45 pm - 8:00 pm	**Jian Luo** (Clemson Univ. Clemson SC) "Quasi-liquid Interfacial Films and Activated Sintering"
8:00 pm - 8:15 pm	**Yet-Ming Chiang** (MIT, Cambridge MA) "Surficial Films"
8:15 pm - 8:30 pm	Discussion
8:30 pm - 9:30 pm	**Brief Poster Presentations**
	Discussion Leader: **Robert Cook** (NIST, Gaithersburg MD)
9:30 pm - 11:00 pm	Poster Session
TUESDAY	
7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	**Grain Growth Control in Bulk Materials**
	Discussion Leader: **Helen Chan** (Lehigh U., Lehigh PA)
9:00 am - 9:40 am	**Susan Trolier-McKinstry** (Penn. State U., State College PA) "Patterning Ceramics by Microcontact Printing and Patterned Grain Growth"
9:40 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:10 am	**Suk-Joong Kang** (KAIST, Deajong South Korea) "Microstructural Design in Ceramics via Control of Interface Structure and Defects"
11:10 am - 11:30 am	Discussion
11:30 am - 12:10 pm	**Martin Harmer** (Lehigh Univ., Lehigh PA) "Mechanisms of 'Solid State' Single Crystal Conversion"
12:10 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 6:00 pm	Free Time
6:00 pm	Dinner
7:30 pm - 9:30 pm	**Interfaces and Grain Boundaries**
	Discussion Leader: **Susan Sinnott** (U. Florida, Gainesville FL)
7:30 pm - 8:10 pm	**Z.L. Wang** (Georgia Tech., Atlanta GA) "Novel Nanostructures of Functional Oxides - from Synthesis, Growth Mechanisms, Properties to Nanodevices"

8:10 pm - 8:30 pm	Discussion
8:30 pm - 9:10 pm	**I-Wei Chen** (U. Pennsylvania, Philadelphia PA) "Controlled Grain Growth in Nanomaterials"
9:10 pm - 9:30 pm	Discussion

WEDNESDAY

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	**Thin Films**
	Discussion Leader: **Susanne Stemmer** (UCSB, Santa Barbara CA)
9:00 am - 9:40 am	**Glen Fox** (Ramtron Corp., Colorado Springs CO) "Thin Films Texture and Scaling Effects in Ferroelectric Random Access Memory"
9:40 am - 10:00 am	Discussion
10:00 am	Coffee Break
10:30 am - 11:10 am	**Marcel Rost** (U. Leiden, Leiden The Netherlands) "Seeing Thin Films Evolve with Real-Time, In-Situ STM: Film Growth and Grain Growth"
11:10 am - 11:30 am	Discussion
11:30 am - 12:10 pm	**Paul Salvador** (Carnegie Melon U., Pittsburgh PA) "Thin Film Deposition and Growth"
12:10 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 6:00 pm	Free Time
6:00 pm	Dinner
7:30 pm - 9:30 pm	**Characteristics of Microstructure**
	Discussion Leader: **Greg Rohrer** (Carnegie Melon U., Pittsburgh PA)
7:30 pm - 8:10 pm	**Pat Patterson** (U. Alabama, Birmingham AL) "Topological Affinities in Grain Growth"
8:10 pm - 8:30 pm	Discussion
8:30 pm - 9:10 pm	**Brent Adams** (Brigham Young U, Salt Lake UT) "Pair Correlation Functions and Second-Order Homogenization Relations for Polycrystals"
9:10 pm - 9:30 pm	Discussion

THURSDAY

7:30 am - 8:30 am	Breakfast
8:30 am - 9:00 am	Business Meeting
	(Nominations for the next Vice Chair; Fill out Conference Evaluation Forms; Discuss future Site & Scheduling preferences; Election of the next Vice Chair)
9:00 am - 12:30 pm	**Fuel Cells**
	Discussion Leader: **John Halloran** (U. Michigan, Ann Arbor MI)
9:00 am - 10:00 am	**Jürgen Fleig** (TU Wien, Vienna Austria) "Micropatterned Thin Film Electrodes in Solid Oxide Fuel Cell Research: Experiments and Modeling"
10:00 am - 10:30 am	Discussion
10:30 am	Coffee Break
11:00 am - 12:00 pm	**Katsuyo Thornton** (U. Michigan, Ann Arbor MI) "Experiments and Simulations of Three-Dimensional Microstructures of Solid Oxide Fuel Cell Electrodes"
12:00 pm - 12:30 pm	Discussion

12:30 pm	Lunch
1:30 pm - 6:00 pm	Free Time
6:00 pm	Dinner
7:30 pm - 9:30 pm	**Thursday Evening Speaker** Discussion Leader: **John Blendell** (Purdue U., West Lafayette IN) **Tom Turpin** (Purdue Univ. West Lafayette, IN) "Insects and the World Food Supply" Discussion
FRIDAY	
7:30 am - 8:30 am	Breakfast
9:00 am	Depart

CERAMICS, SOLID STATE STUDIES IN

Proctor Academy
Aug 13-18, 2006

Name	Organization	Participation	Status
MONIKA BACKHAUS	CORNING INCORPORATED	Poster Presenter	Registered
KANTESH BALANI	FLORIDA INTERNATIONAL UNIVERSITY	Poster Presenter	Registered
PRABEER MR BARPANDA	RUTGERS UNIVERSITY	Poster Presenter	Registered
SANDIP BASU	DREXEL UNIVERSITY	Poster Presenter	Registered
SHANTANU K BEHERA	LEHIGH UNIVERSITY	Poster Presenter	Registered
MICHAEL A BESTOR	THE UNIVERSITY OF ALABAMA	Attendee	Registered
ABHILASHA AB BHARDWAJ	CARNEGIE MELLON UNIVERSITY	Attendee	Registered
DUNBAR P BIRNIE	RUTGERS UNIVERSITY	Attendee	Registered
CATHERINE M BISHOP	OXFORD UNIVERSITY	Speaker	Registered
JOHN E BLENDELL	PURDUE UNIVERSITY	Chair	Registered
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TIMOTHY E CHIN	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Poster Presenter	Registered
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SARTHAK HAVELIA	CARNEGIE MELLON UNIVERSITY	Poster Presenter	Registered
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THOMAS R HINKLIN	SANDIA NATIONAL LABORATORIES	Poster Presenter	Registered
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BRYAN D HUEY	UNIVERSITY OF CONNECTICUT	Poster Presenter	Registered
ALLEN H HUNTER	MICHIGAN TECHNOLOGICAL UNIVERSITY	Poster Presenter	Registered
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EVA JUD	MIT	Attendee	Registered
SUK-JOONG L KANG	KAIST	Speaker	Registered
SUK JUN KIM	PURDUE UNIVERSITY	Poster Presenter	Registered
CHEKESHA LIDDELL	CORNELL UNIVERSITY	Speaker	Registered
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BRIAN E PICCIONE	PURDUE UNIVERSITY	Poster Presenter	Registered
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VEENA TIKARE	SANDIA NATIONAL LABORATORIES	Speaker	Registered
SUSAN TROLIER-MCKINSTRY	THE PENNSYLVANIA STATE UNIVERSITY	Speaker	Registered
THOMAS TURPIN	PURDUE UNIVERSITY	Speaker	Registered
KENT J VANEVERY	PURDUE UNIVERSITY	Poster Presenter	Registered
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JAMES A WARREN	NIST	Speaker	Registered
MARK L WEAVER	THE UNIVERSITY OF ALABAMA	Speaker	Registered
LETA Y WOO	LAWRENCE LIVERMORE NATIONAL LAB	Speaker	Registered
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DUK YONG YOON	KAIST	Attendee	Registered
HUI-CHIA YU	UNIVERSITY OF MICHIGAN	Poster Presenter	Registered
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