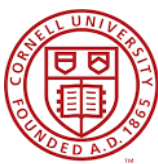




NSF - Partnership for Research and Education in Materials - Advanced Interface Materials



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Project Overview

The NSF PREM for Advanced Interface Materials will focus on the design, synthesis and characterization of new oxide-based interface materials for the next generation of electronic, magnetoelectronic and optoelectronic devices. The main goals of the program are to significantly strengthen CAU and Spelman College engagement in materials science research and increase the participation of underrepresented minorities, mainly African-American students, in this field.

The PREM project's framework elements will include engaging undergraduate and graduate students in materials science research, seminars and hands-on workshops, throughout the academic year and summers, supported by postdocs, and faculty at the three institutions. The PREM pathway will increase the number of STEM B.S and Ph.D. degrees attainment by African Americans, the predominant population served by the two Historically Black Colleges and Universities (HBCUs) involved.

Partner Institutions

- Clark Atlanta University
- Spelman College
- Cornell University - NSF Materials Innovation Platform for the Accelerated Realization, Analysis, and Discovery of Interface Materials at Cornell University and Johns Hopkins University

Research Thrusts

Publications

Outreach

PREM Highlights and Events

PARADIM

Organizational Structure

Clark Atlanta University

Dr. Conrad W. Ingram

(Principal Investigator)

Dr. Xiao-Qian Wang

(Co-Principal Investigator)

Dr. Xinle Li

Dr. Seyhan Salman

Dr. Ishrat Khan

Dr. Dinadayalane Tandabany

Dr. Michael Williams

Spelman College

Dr. Natarajan Ravi

Cornell University-PARADIM

Dr. Darrell Schlom

(Co-Principal Investigator)

Dr. Lena F. Kourkoutis

Postdoc(s)

Dr. Fazli Akram

Students

https://www.paradim.org/2023_PREM_REU_participants

Program Assistant

Cheryl Croft

Contact: cingram@cau.edu

Research Thrusts

The program is organized into three interdisciplinary research thrusts (IRTs), namely, Oxide-Oxide Interfaces (IRT-1), Oxide-Covalent Organic Framework (COF) Interfaces (IRT-2), and Oxide-Polymer Interfaces (IRT-3).

- IRT1: Oxide – Oxide interfaces
Researchers: Ravi (Lead), Williams, Wang, Kourkoutis, Schlom

To create interface materials enabling electrical control of magnetism at room temperature, we will jointly theorize, synthesize, and characterize two promising magnetoelectric systems. Both systems involve interfaces between iron-containing oxides as all known room-temperature (or higher) magnetoelectrics, or magnetoelectric multiferroics are oxides containing iron.

- IRT 2: Oxide - Metal-Organic Framework interfaces
Researchers: Li (lead), Ingram, Kourkoutis, Muller, Tandabany, Salman

The precise assembly of 2D layered materials into sophisticated heterostructures is of scientific interest and technological significance in material chemistry. Van der Waals heterostructures epitomize this concept and artificially stack two atomically thin layered materials laterally or vertically, paving new avenues to design hybrid interfaces and functional devices. The organic-inorganic interfaces between these two 2D materials may generate unusual magnetic properties.

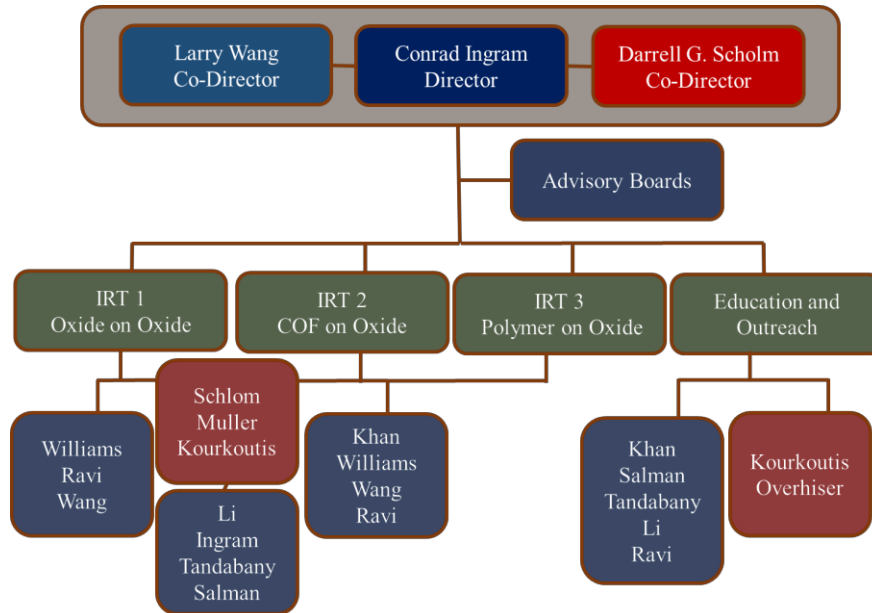
- IRT 3: Oxide - Polymer Interfaces
Researchers: Khan (lead), Williams, Wang, Schlom, Kourkoutis, Muller

Interfaces between polymers and crystalline solids play an important role in a range of technological applications. In IRT-3, we will investigate polymer composites with unique conducting properties, made by templating the assembly of conducting ferroelectric polymers from the ordered polarization 15 motifs provided by inorganic ferroelectric oxides.

Publications

- In-situ grown of FeCo_2O_4 @ 2D-Carbyne coated nickel foam-A newer nanohybrid electrode for high performance asymmetric supercapacitors, P Dhandapani, B Balan, T Dinadayalane, S Angaiah, Journal of Energy Storage 56, 105943, 2022
- Molecular beam epitaxy of KTaO_3 , Tobias Schwaigert, Salva Salmani-Rezaie, Matthew R. Barone, Hanjong Paik, Ethan Ray¹, Michael D. Williams, David A. Muller, Darrell G. Schlom, and Kaveh Ahadi, Journal of Vacuum Science & Technology A 41, 022703 (2023); <https://doi.org/10.1116/6.0002223>
- Facile Microwave-Assisted Synthesis of 2D Imine-Linked Covalent Organic Frameworks for Exceptional Iodine Capture", Alsudairy, Ziad; Brown, Normanda; Yang, Chongqing; Cai, Songliang; Akram, Fazli; Ambus, Abrianna; Ingram, C. W.; Li, Xinle (Under review)

PREM Organizational Structure



External Advisory Committee and Internal Oversight Committee

External Advisory Committee

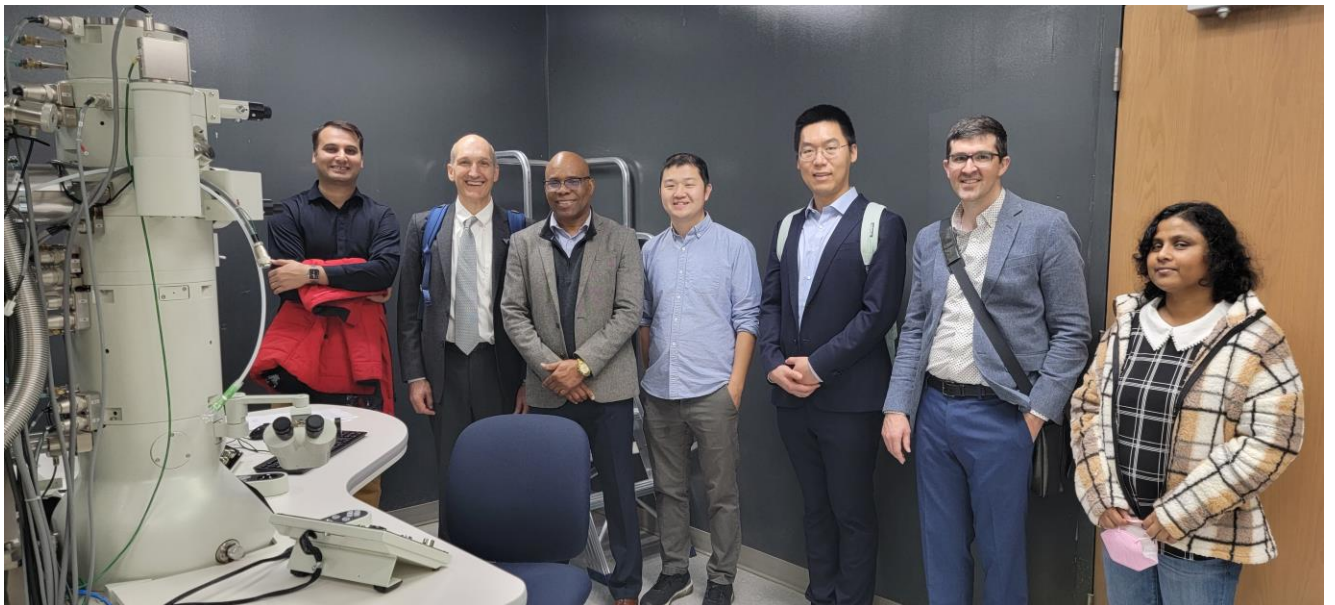
- Dr. Dewayne Daniels (Department Chair and Professor of Chemistry, Fort Valley State University),
- Professor Anthony Guiseppe-Elie, D.Sc. Vice President of Academic Affairs and Workforce Development at Tri-County Technical College and an adjunct professor in the Department of Biomedical Engineering of Texas A&M University
- Mr. Tony Pace (Chief Operating Officer, Johnson Research & Development Co., Inc, Atlanta, GA).

Internal Oversight Committee

- Dr. Jaideep Chaudhary (Dean of Arts and Sciences (CAU))
- Dr. Cimona Hinton, Department of Biological Sciences (CAU)
- Dr. Sandra Rucker (Associate Professor of Mathematics CAU)

Collaboration Activities at CAU and Spelman

PREM Collaboration: PARADIM Researchers (Dr. Darrell Scholm and Evan Li) at CAU and Spelman College on 1/31/2023













PARADIM

PARADIM: https://www.paradim.org/2021_PREM



Partnership for Research and Education in Materials

