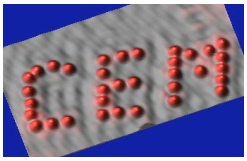


Center for Emergent Materials
at the Ohio State University

a National Science Foundation
Materials Research Science and Engineering Center

SYNOPSIS

The CEM performs integrated research on emergent materials and phenomena in magnetoelectronics. The aim of the CEM is to lay down the scientific foundation for building both future oxide-based electronic devices that can perform multiple functions, and energy-efficient, fast computers that have integrated memory and logic. The scientific foundation is in the form of deep and comprehensive understanding of the emergent materials and phenomena, and the development of highly sophisticated experimental and theoretical tools required to study them.

At the heart of the CEM are two Interdisciplinary Research Groups (IRGs). IRG-1, titled *Towards Spin-Preserving, Heterogeneous Spin Networks*, develops a new understanding of electron-spin injection and transport in low-dimensional, spin-preserving materials such as silicon and carbon. This understanding provides a new materials-basis for creating novel high-density spin networks for next-generation computing. The IRG-1 faculty team of ten is co-led by Profs. P. Chris Hammel and Ezekiel Johnston-Halperin, both of Department of Physics. The other faculty team members are: Profs. Arthur J. Epstein (Physics and Chemistry), Jay A. Gupta (Physics), Julia S. Meyer (Physics), Nitin P. Padture (Materials Science and Engineering), Jonathan P. Pelz (Physics), Steven A. Ringel (Electrical and Computer Engineering), David G. Stroud (Physics), and Roland K. Kawakami (University of California Riverside; Physics).

Hammel

Johnston-Halperin

Epstein

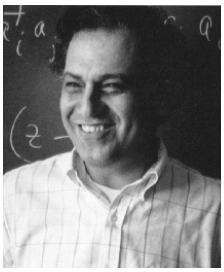
Gupta

Meyer

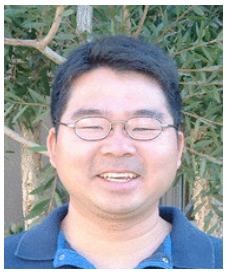
Padture

Pelz

Ringel



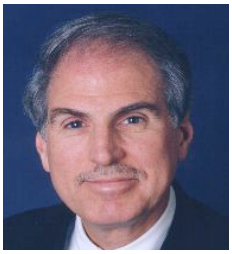
Stroud



Kawakami

IRG-2, titled *Double Perovskite Interfaces and Heterostructures*, designs and controls multifunctional properties of innovative double perovskite heterostructures through the understanding of structure, defects, and magnetotransport properties at interfaces. This new understanding of magnetism in metallic oxides enables important advances in the emerging field of oxide-based electronics. The IRG-2 faculty team of nine is co-led by Prof. Patrick M. Woodward of Department of Chemistry and Prof. Leonard J. Brillson of Department of Electrical and Computer Engineering. The other faculty team members are: Profs. Hamish L. Fraser (Materials Science and Engineering), Thomas R. Lemberger (Physics), Patricia A. Morris (Materials Science and Engineering), Mohit Randeria (Physics), Nandini Trivedi (Physics), Wolfgang Windl (Materials Science and Engineering), and Fengyuan Yang (Physics).


Woodward


Brillson


Fraser


Morris


Lemberger


Randeria


Trivedi


Windl


Yang

A Theory/Modeling Cluster consisting of five faculty members from both IRGs is organized to help integrate experimental and theoretical efforts across the CEM. Prof. Nandini Trivedi (Physics) leads this effort.

The CEM also sponsors a Seed Funding program, which provides the necessary flexibility and vitality to the CEM to develop into new areas within the rapidly-changing landscape of advanced materials research. Profs. Ezekiel Johnston-Halperin and Julia S. Meyer, both of Department of Physics, co-lead this effort.

The multidisciplinary OSU advanced materials community is already home to major world-class shared experimental facilities, which are brought to bear on CEM research and education. The CEM collaborates with the electronics, storage, and instrumentation industries; national laboratories and institutes; other U.S. universities; and international universities and laboratories in China, Germany, India, and United Kingdom. These efforts are led by Prof. Steven A. Ringel (Electrical and Computer Engineering).

Integrated with the research activities, the CEM enhances classroom education, creates research internship opportunities, widens the Science-Technology-Engineering-Math (STEM) "pipeline," and enhances diversity in STEM. Activities include an innovative education research program aimed at cognition of materials science concepts, K-12 outreach and visitation programs, undergraduate research programs, and graduate-education enhancement programs.

Prof. Katharine M. Flores (Materials Science and Engineering) leads this overall effort. Prof. Andrew F. Heckler (Physics) leads the education research effort, and Dr. Christopher Andersen (OSU Office of Research) coordinates the outreach effort.

Flores

Heckler

Andersen

There are about 75 personnel involved in the CEM, including 21 faculty members from 2 colleges and 4 departments; 3 senior investigators; 25 graduate students; 2 post-doctoral scholars; 20 undergraduate students; and 4 staff members.

Prof. Nitin P. Padture of Department of Materials Science and Engineering is the Director of the CEM. The CEM administrative office is located in the Physics Research Building (191 West Woodruff Avenue) on the OSU main campus in Columbus.

The CEM was established on September 1, 2008, with $10.8 million in funding from NSF and $6.2 million in cost share from OSU, for six years.

NSF press release can be found at: http://www.nsf.gov/news/index.jsp

OSU press release can be found at: http://www.osu.edu/news/index.php

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Contact:

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