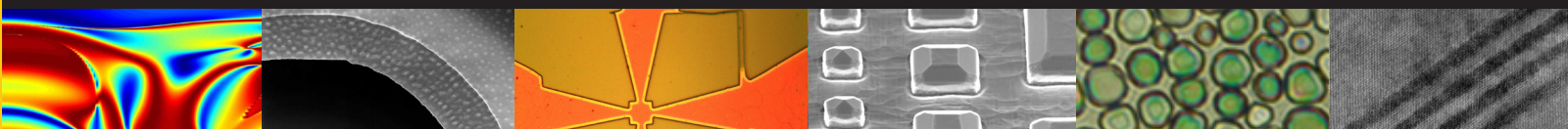




Designing, synthesizing and understanding disordered materials, and the emergence of order across a wide range of materials platforms, with technological impact spanning from clean energy to quantum information sciences.



The Wisconsin MRSEC brings together teams of researchers from diverse disciplinary backgrounds to address a critical void in knowledge involving disordered materials, and the emergence of order from disordered materials. The Center integrates the discovery of new knowledge with creation of research-inspired educational materials, innovative programs that broaden participation in STEM fields, industry outreach to promote economic advancement, and professional development opportunities that train the next-generation US workforce.

Center research is organized into interdisciplinary research groups addressing complex challenges involving metals, inorganic oxides, semiconductors and organic molecular assemblies:

One interdisciplinary group leverages the cross fertilization of ideas and techniques from inorganic and organic glass research to address fundamental questions related to the structure and properties of glasses. The team builds on the discovery that physical vapor deposition can increase kinetic and thermodynamic stability of organic glass films. A second interdisciplinary group explores and

engineers the growth of complex metal oxide crystals from amorphous layers, with a focus on compositions and designs of epitaxial structures unconstrained by requirements of thermodynamic stability. The approach provides access to 3D geometries that are inaccessible via current methods.

The Wisconsin MRSEC is also home to a cross-cutting interdisciplinary team of computational scientists. The goal of this team is to facilitate synergies related to computation across the Center.

HIGHLIGHTS . . .

The Wisconsin MRSEC is developing best practices in management and sharing of materials data. These efforts include use of data repositories, development of a research products portal, and data management training through professional development seminars.



Atom Probe Sample

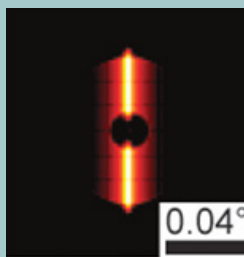
Atom Touch Game



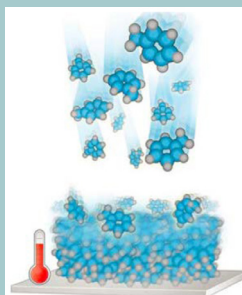
The Wisconsin MRSEC is creating research-inspired digital, educational games to enhance student learning by situating it in a context of problem solving, inquiry and exploration. Outreach using digital games scales to large audiences with minimal distribution costs.

RESEARCH FUNDAMENTALS...

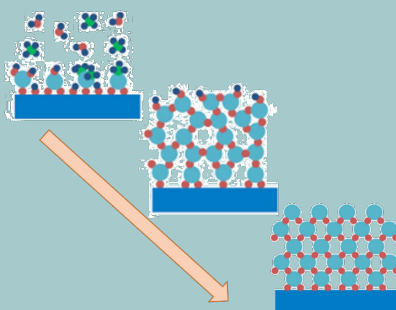
The Wisconsin MRSEC is leading the way in developing instrumentation and best practices for data management to revolutionize materials synthesis and characterization. Examples include development of an ultrafast camera for electron microscopy, and unique X-ray instrumentation that combines *in situ* materials synthesis and nanoscale imaging.



The Wisconsin MRSEC is developing fundamental insight into glass stability, the glass transition, and various structure – property relationships using a unique materials platform of glasses with hugely varying stability. The research is enabling diverse applications by creating ultrastable glass thin films of various materials: ultralow-loss oxide dielectrics for quantum computing and mirrors, ultrasoft metallic glass hard coatings, and materials for organic electronics.



The Wisconsin MRSEC is achieving transformative advances in the synthesis, understanding and application of complex oxide crystals from amorphous layers. The materials emerging from the MRSEC have the potential to impact technologies from electronics, clean energy and optics to such diverse areas as glass devitrification in nuclear storage and biomineralization.



“I am struck by the unanticipated solutions to complex materials problems that arise within the MRSEC from the interactions of faculty and students from diverse disciplinary backgrounds.”

Paul Voyles
Director, Wisconsin MRSEC



WISCONSIN MRSEC EDUCATION OUTREACH AND PARTNERSHIPS...

- Research Experience for Undergraduates:** undergraduates conduct summer research in a materials-related area of engineering, physics, chemistry, science education, or public policy.
- Research Experience for Teachers:** middle and high school teachers from Puerto Rico and Wisconsin develop learning modules based on their laboratory research.
- The Wisconsin Institutes for Discovery:** partner for development and dissemination of materials science education resources to K-12 students and the general public.
- Wisconsin Advanced Materials Industrial Consortium:** partner in university-industry collaboration in advanced materials and manufacturing fields.
- Materials Research Facilities Network and Regional Materials and Manufacturing Network:** partners in expanding the use of the Shared Experimental Facilities.

OUTREACH

More information about the workshops, internships, partnerships, and educational opportunities are available at www.mrsec.wisc.edu

