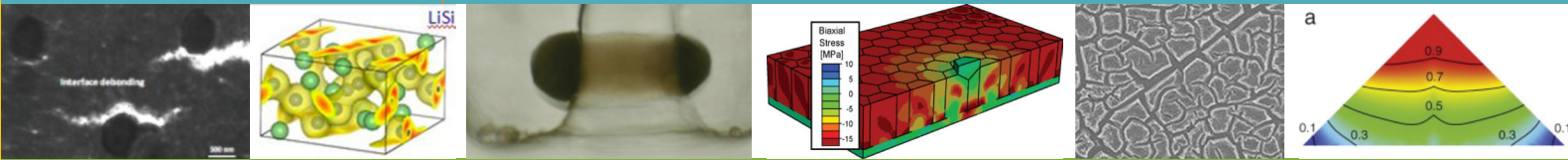


Brown logo as black only version to reverse out of background

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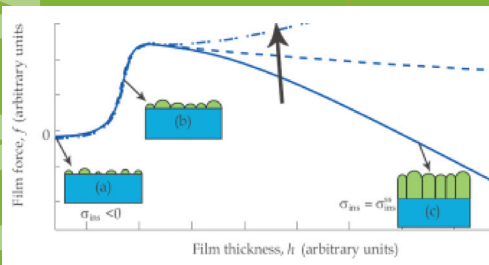
Utilizing Stress-Driven Phenomena to Control and Design the Growth, Performance, and Degradation of Engineered Materials



The focus of Brown's MRSEC is on Mechanics of Materials at the micro and nano scales.

The role of mechanics – the interplay of stress and deformation – is pervasive across materials systems and applications in industries including Aerospace, Automotive, Electronics, Computer, Infrastructure, Energy Generation and Storage, and Medical Devices, arising because an integral combination of stress, temperature, chemistry, and microstructure influences all phases in the life cycle of a material system. Research at Brown is advancing the scientific and engineering foundations of the field, including understanding and control of stresses in thin film materials; formation and performance of nanoscale structures; multiscale

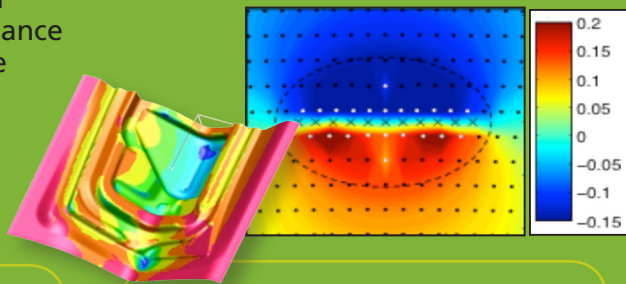
modeling of structural materials; and uncovering the role of stress in driving biological processes at the cellular level. A combination of innovative experiments and novel theoretical/computational approaches is used to tackle each problem. New science emerging from the Center has impact on technology through close interactions with industry. Outreach to the Rhode Island community through a range of educational programs complements the research in the Center.



HIGHLIGHTS . . .

Achieved a comprehensive understanding of the fundamental mechanisms controlling stress evolution during polycrystalline thin film deposition across a range of materials.

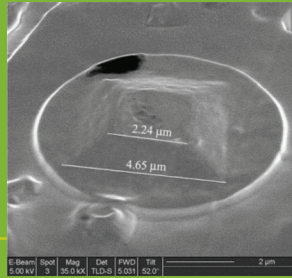
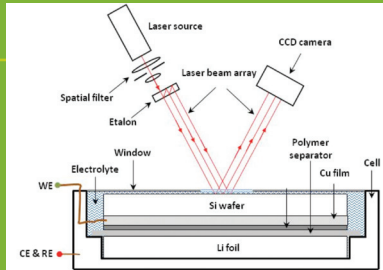
Developed, in collaboration with GM, a mechanistically-based multiscale model of dynamic strain-aging in Al-Mg alloys culminating in the prediction of reduced ductility in the domain of negative strain rate sensitivity.



DIRECTOR: W. A. Curtin,
<http://www.brown.edu/Departments/IMNI/MRSEC/>

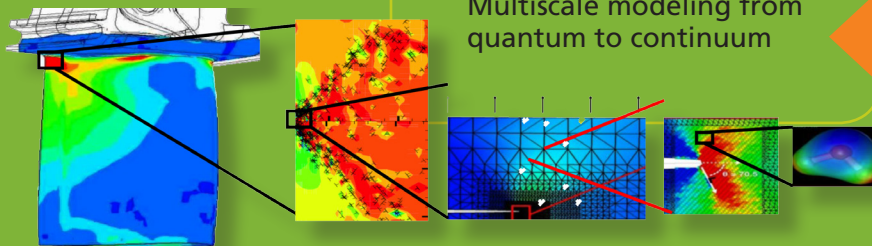
RESEARCH FUNDAMENTALS . . .

In-situ measurement of stress during growth, dissolution, charging



Nanomechanics fabrication and testing

Multiscale modeling from quantum to continuum



Our ability to measure and compute the evolution of stresses in structural, electronic, energy, and biological systems is leading to the discovery of new processing methods, new mechanisms of deformation and failure, and new insights into the design of engineered materials for enhanced performance and durability. //

W. A. Curtin, Director
MRSEC



MRSEC OFFERS DIVERSE EDUCATION AND PARTNERSHIPS...

- Education program 1:** "Research Experience for Undergraduates" program in association with the Leadership Alliance, a national organization aimed at increasing participation of underrepresented minorities in research.
- Education program 2:** "Research Experience for Teachers" summer program with activities ranging from in-depth lab research to innovative curriculum development projects.
- Outreach program 1:** "Empowering your Future", a workshop engaging middle-school girls in hands-on science and engineering while teaching parents how to encourage curiosity and foster strong study skills in their daughters.
- Partnership 1:** The General Motors/Brown Collaborative Research Laboratory on Computational Materials Science pursues research to accelerate innovation in two strategic materials technology areas at GM, lightweight metals and battery materials.
- Partnership 2:** A new venture with Medtronic focuses on mechanical properties and durability of high strength steels, engineered surfaces for biofunctionality, and mechanics and durability of battery materials.

More information about the workshops, internships, partnerships, and educational opportunities are available at:
<http://www.brown.edu/Departments/IMNI/MRSEC/education/>
 and <http://www.brown.edu/Departments/IMNI/MRSEC/industry/>

