

Name: Scott W. MacLaren

Research fields of interest:

- Advanced Atomic Force Microscopy techniques and other forms of scanning probe microscopy
- Nanostructure formation
- Ion beam interactions with surfaces
- Nanotechnology development in general

I am a Senior Research Scientist here at MRL, and have over thirty years of experience with materials characterization techniques right here in the Materials Research Lab central facilities, including my time working here as a grad student and postdoc. I have direct experience using almost all our techniques, including extensive experience with high resolution Scanning Electron Microscopy (SEM), Secondary Ion Mass Spectrometry (SIMS) and Sputtered Neutral Mass Spectroscopy (SNMS).

Instrumentation/core of responsibility within the MRL:

-Atomic Force Microscopy

Education and Experience:

I attended the Massachusetts Institute of Technology for undergraduate studies in physics, followed by graduate study and post-doctoral research in semiconductor nanostructure formation here at UIUC. Following several years of entrepreneurial and consulting work in early stage nanotechnology, I returned to UIUC to continue my research in nanostructures and to develop and run the atomic force microscopy facility in the Materials Research Laboratory. My research has focused on the control of nanostructure growth for advanced lithium-ion battery and solar cell applications, and is now mostly focused on advanced AFM imaging techniques and related chemical and nano-mechanical measurements.

Selected publications:

"CdCl₂ Treatment-Induced Enhanced Conductivity in CdTe Solar Cells Observed Using Conductive-Atomic Force Microscopy", Tuteja, Mohit; Mei, Antonio; Palekis, Vasilios; Hall, Allen; MacLaren, Scott; Ferekides, Chris; Rockett, Angus, (submitted to *The Journal of Physical Chemistry Letters*, 2016)

"Direct Observation of CdCl₂ Treatment Induced Grain Boundary Carrier Depletion in CdTe Solar Cells Using Scanning Probe Microwave Reflectivity Based Capacitance Measurements", Tuteja, Mohit; Koirala, Prakash; Palekis, Vasilios; MacLaren, Scott; Ferekides, Chris; Collins, Robert; Rockett, Angus, *Journal of Physical Chemistry C* 120, 7020-7024 (2016).

"Scanning Probe Microwave Reflectivity of Aligned Single-Walled Carbon Nanotubes: Imaging of Electronic Structure and Quantum Behavior at the Nanoscale", Seabron, Eric; MacLaren, Scott; Xie, Xu; Rotkin, Slava V; Rogers, John; Wilson, William, *ACS Nano*, 10 (1) 360-368 (2016).

"Direct observation of electrical properties of grain boundaries in sputter-deposited CdTe using scan-probe microwave reflectivity based capacitance measurements", Tuteja, Mohit; Koirala, Prakash; MacLaren, Scott; Ferekides, Chris; Collins, Robert; Rockett, Angus, *Applied Physics Letters*, 107 (14) (2015).

"Hierarchically textured Li_xMn_{2-y}O₄ thin films as positive electrodes for lithium-ion batteries," Martin Bettge, Seung Yoon Ryu, Scott MacLaren, Steve Burdin, Ivan Petrov, Min-Feng Yu, Ernie Sammann, and Daniel Abraham, *Journal of Power Sources*, 206 288 (2012).

"Ion-induced surface relaxation: controlled bending and alignment of silica nanowire arrays," Martin Bettge, Scott MacLaren, Steve Burdin, Richard Haasch, Daniel Abraham, Ivan Petrov, Min-Feng Yu and Ernie Sammann, *Nanotechnology* 23 (17) (2011). Featured on journal cover.

"Temperature and thickness evolution and epitaxial breakdown in highly-strained BiFeO₃ thin films," A.R. Damodaran, S. Lee, J. Karthik, S. MacLaren, L.W.Martin, *Phys. Rev. B*, 85 (2) (2012).

"Importance of line and interfacial energies during VLS growth of finely stranded silica nanowires," Martin Bettge, Scott MacLaren, Steve Burdin, Daniel Abraham, Ivan Petrov, Min-Feng Yu and Ernie Sammann, *Journal of Materials Research*, 26 2247 (2011).

"Low-temperature vapour–liquid–solid (VLS) growth of vertically aligned silicon oxide nanowires using concurrent ion bombardment," Martin Bettge, Scott MacLaren, Steve Burdin, Jian-Guo Wen, Daniel Abraham, Ivan Petrov, and Ernie Sammann, *Nanotechnology* 20 (11) 115607 (2009).

"Molecular Scale Buckling Mechanics in Individual, Aligned Single-Wall Carbon Nanotubes on Elastomeric Substrates," D. Khang, J. Xiao, C. Kocabas, S. Maclaren, T. Banks, H. Jiang, Y. Huang, and J. Rogers, *Nano Letters*, 8 (1): 124-130 (2008).

"Controlling Bistability in Tapping-Mode AFM using Dual Frequency Excitation", P. Thota, S. MacLaren and H. Dankowicz, *Applied Physics Letters*, 91 (9) (2007).