

University of Wisconsin-Milwaukee

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COLLOQUIUM

*Chemical analysis with sub-Å resolution:
The power and challenges of aberration-corrected
scanning transmission electron microscopy*

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3:00 PM (coffee/cookies at 2:45 PM)
Physics - Room 135

The last few years have seen a paradigm change in (scanning) transmission electron microscopy, (S)TEM, with unprecedented improvements in both spatial and spectroscopic resolution being realized by aberration correctors, cold-field emission guns and monochromators. The spatial resolution now extends to the sub-angstrom level, while the spectroscopic resolution has reached the sub-100 meV regime. In-situ stages have further extended the temperature range where atomic-resolution can be achieved between 10 K and 1000 K. These instrumentation developments have brought notable successes in materials analysis, in particular for interfacial, catalysis and thin-film studies. However, they have also challenged the established experimental protocols and our fundamental understanding of both imaging and spectroscopy in the STEM.

In this presentation, examples of where the new instrumentation has been successfully used to address materials physics issues in nanoscale systems will be described, including magnetic transitions in oxide thin films, charge transfer in thermoelectric oxides, and promoter diffusion in heterogeneous nano-catalysts. Furthermore, the challenges associated with operating these new STEMs for reliable quantitative imaging and spectroscopy will be discussed. Finally, I will present a perspective on the future developments in STEM analysis.