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Prospects of Aberration-Corrected STEM for Nanoscience

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Aberration-correction is currently one of the most exciting developments in electron microscopy, doubling the achievable resolution and providing sensitivity to single impurity or dopant atoms. Such data is ideally complemented by first-principles theory, which gives insight into atomic configurations, energetics and reaction mechanisms. Two Nion aberration correctors are presently installed at Oak Ridge National Laboratory, and examples will be presented from several areas of nanoscience, including the mechanism of metal-catalyzed growth of single-wall carbon nanotubes, La-stabilization of γ-alumina for catalyst supports, activity of gold and semiconductor nanocatalysts, and the optical properties of semiconductor quantum dots. Prospects for single atom analysis and three-dimensional atomic-resolution tomography will be discussed.

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