## Novel Solutions in SEM Imaging and Microanalysis for Advancing Materials Research

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As micro- and nanoscale devices in materials science research continue to shrink, imaging and characterizing smaller structures by scanning electron microscopy (SEM) has become increasingly important. Technologic advancements in both microscope performance and detector design permit novel advanced solutions for the examination of these features in a wide range of materials. Ultra-low accelerating voltage (kV) imaging with an in-lens detector allows for unmatched ultrahigh resolution, even of beam sensitive or charging specimens. Ideally, chemical analysis by Energy Dispersive Spectroscopy (EDS) would quickly characterize any nanoscale features observed during imaging. In practice, however, standard EDS requires analysis conditions that are incompatible with high-resolution imaging (higher kV, larger probe currents, longer working distance), therefore limiting or precluding the ability to analyze very small features. New cutting-edge windowless EDS detectors can now facilitate high resolution imaging and nanoscale analysis at the same conditions. These detectors are designed for higher sensitivity and spatial resolution even at ultra-low kVs, permitting detection even of very low energy X-rays including Li-K and Si-L. This presentation will provide an overview of these novel technologies with examples from a variety of materials research applications using modern topof-the-line field emission SEMs.