Bruker’s industry-leading Hysitron® SPM imaging and XPM™ Accelerated Property Mapping modes are now available for in-situ scanning electron microscopy (SEM) with the Hysitron PI 88 SEM PicoIndenter®. By utilizing piezo-actuated scanning stages in feedback control with the transducer, the tip can be rastered relative to the sample with nanoscale precision and high-velocity. This enables topographical imaging based on the force feedback (SPM), as well as high-throughput mechanical testing within the scanning grid (XPM). By adding SPM and XPM to the in-situ SEM testing environment, the advantages of ex-situ nanoindenters can be realized in entirely new areas of research, enabling high-resolution electron imaging and correlated structural and chemical analyses from EDS/EBSD to be combined with high-throughput testing and quantitative topographical information.

**In-Situ SEM Nanomechanics with SPM Imaging and XPM Mapping**

**SEM PicoIndenter with SPM and XPM Provides:**

- Proven SPM imaging capabilities for quantitative, nanoscale topographical characterization of pre- and post-test surfaces
- Correlated topography data from SPM, and hardness/modulus maps from XPM with SEM imaging and supplementary analysis techniques, like EDS and EBSD
- High-throughput mechanical property metrology, with multiple measurements per second
- Rapid generation of statistical quantities of data
SPM Imaging

Even though topographical features can be viewed in high-resolution with secondary electron imaging in the SEM, quantitative topographical data is challenging. Scanning probe microscopy (SPM) can address this issue by using the same probe to image the sample surface as is used to perform the indentation testing. This provides accurate height information of sample features as well as such parameters as surface roughness. This capability is also particularly useful for analyzing post-test deformation, such as measuring pile-up or sink-in from nanoindentation.

XPM Mapping

In-situ SEM nanomechanical testing is generally positioned through user input, one test at a time, and is therefore relatively low throughput. Individual indents can be placed into different phases or grains of inhomogeneous materials, but measuring the actual spatial and statistical distribution of properties is impractical without an increase in throughput. XPM mode enables the Hysitron PI 88 to rapidly screen materials and locate features of interest, including material phases with unique modulus changes or hardened regions from materials processing history.

Uncommon Ease of Use

Users experienced with SPM imaging and XPM property mapping with Hysitron ex-situ nanoindenters will find familiar software controls and system performance when using these modes for in-situ SEM. SPM imaging can be performed with adjustable scan rates, gain, resolution, force setpoints, scan sizes, and aspect ratios. For XPM mapping, the test editor allows the user to easily define the loading rate, indentation spacing, and grid size. Together, these proven technologies bring new capabilities without a steep learning curve to SEM applications.