

Imaging nanocrystalline diamond with the new TESCAN S8000 microscope

Nanocrystalline diamond is a solid film of nano-sized diamond particles which are grown by chemical vapour deposition on substrates such as silicon wafers. The nanocrystalline diamonds preserve the extreme properties of diamond such as hardness but at substantially lower costs. Their hardness, toughness and surface stability are important properties of these structures which make them suitable for diverse applications in nanotechnology, reasons of which it is important to make progress in their characterisation.

The new TESCAN S8000 microscope is equipped with the BrightBeam™ SEM column and a robust detection system comprised of in-chamber E-T and BSE detectors and powerful in-beam detectors with angle-selective and energy-filtering capabilities. The new TESCAN BrightBeam™ SEM column technology achieves field-free ultra-high resolution by means of a combined electrostatic-magnetic objective lens design. Such electron optics is designed to provide excellent performance especially at low beam energies. These

features provide excellent image contrast, high spatial resolution and surface sensitivity needed to resolve nano-sized structures in nanocrystalline diamonds, see Figure 1. The electron signals collected by the detection system can all be acquired simultaneously and be combined for maximum insight into the sample. The detection system gives complete control on surface sensitivity and thus the option to explore different contrasts from pure topographic or material to combination of both.

► **Figure 1:** Fault planes and complex geometries of individual particles in nanocrystalline diamonds on Si substrate acquired at 2 keV with the four detectors Multidetector (top left), Axial detector (top right), E-T detector (bottom left) and BSE detector (bottom right).

