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Title: Advancing multimodal characterization at the nanoscale with the TESCAN TENSOR analytical 4D-STEM

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Abstract Body:

Nanoscale characterization providing information about crystalline structure, as revealed by the diffraction pattern, and the ability to relate that information to a particular location in the sample, is essential for understanding and improving the mechanical and other physical properties of metals, alloys, composites, and other materials. The power of analytical 4D-STEM lies in its ability to acquire a complete image of the sample as well as crystallographic and compositional information across the field of view with nanometer-scale spatial resolution.

Scientists and engineers who need this kind of information work in a variety of disciplines, including materials science, semiconductor manufacturing, process development, and many more fields of product development, production, and quality control. Across these disciplines, practitioners were aware of the potential benefits of S/TEM but have historically been turned off by the perceived operational difficulty of the instrumentation. They want practical results, and the less time, effort, and money required to get the result, the better.

TESCAN TENSOR addresses these needs by automating almost every microscope function. This unprecedented automation is only possible because it has been integrated into the microscope design from the beginning. With a result-centric design, TENSOR's quality, throughput, and robustness of 4D-STEM acquisition, analysis, and processing has been optimized with state-of-the-art technologies, such as precession electron diffraction (PED), 4D-STEM computing and visualization, electrostatic beam blanking, and ultra-high vacuum at the specimen area. The real-time, automated data analysis and processing empowers an unprecedented level of system accessibility, utilization, and productivity.

The methodology behind TESCAN's analytical 4D-STEM microscope will be explained as the solution of choice for a range of nanoscale applications. Examples including results from nickel-based superalloy indentation studies, complex semiconductors, multi-phase polycrystalline films, and battery anodes will be presented.

Topic: Characterization

Presentation: Oral

Keywords: electron microscopy; analytical; multimodal; diffraction; 4D-STEM; precession; grain distribution; boundaries; 3D structure