Advanced FIB/SEM techniques and applications

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TESCAN ORSAY HOLDING

Since the 1980´s nanotechnology in engineered as well as natural nanomaterials grew rapidly. While in the past, practical implications of nanomaterials were not that significant, nowadays are playing important role across all industrial fields. In engineering, processes are developed to produce nanofibers and nanoparticles with physical and mechanical properties significantly different to their macro- counterparts. Materials of daily use such as textile or paints contains nanomaterials which grants them durability and/or antibacterial assets. Different nanomaterials are used also for medical purposes. Nowadays, some specific nano-materials help in the curing of cancer or in bandages heal wounds faster. The most important and the immense impact have nanotechnology in the semiconductor industry. It is less than 100 years when the first computer ENIAC was developed. It was 30 m long, 3 m high and 1 m wide. Even though its size was impressive, computing power was just a fraction of modern cell-phones which fits easily in our pocket. The small size and high computing power are possible due to nanotechnology. The semicon-chips are currently designed with nanometric precisions and single transistor has size below 10 nm. Currently, hundred millions of them are aligned in 1 mm^2 of commercial microchip and that providing calculating power at minimum space.

Due to these facts, TESCAN developed solutions for practical and research applications. Different TESCAN´s unique SEM columns were designed and are currently meeting all the requirement to image basically any nanofeatures in size between 1 - 100 nm. “Conventional” SEM tungsten filament can be used at industrial companies in quality control. On the other hand “high end” SEM with Triglav™ immersion technology can easily capture ulra high resolution images and meet requirement of resolution 1 nm at 1kV of accelerating voltage. In 2017 new TESCAN SEM with BrightBeam™ Technology offered resolution 1.7 nm at 1 kV and met the demand for field free universal ultra high-resolution SEM. These TESCAN SEM columns can be combined with various focused ion beam columns (Ga^+ or Xe^+) to create a perfect instrument for cross-sectional and STEM investigations of nanomaterials.

TESCAN builds its reputation also in a field of analytical instrumentation. Aside from successful cooperation with all major producers of EDX, EBSD or WDS, only TESCAN currently offers Time of flight secondary ion mass spectrometry. This allows studying not only light and heavy elements (starting from hydrogen), but also their isotopes. Mapping, depth profiling, and spectrum analysis are available immediately after single measurement. This novelty helped to solve many industrial problems and assisted in many research tasks.

In our talk, we are going to present recent advancement and applications with TESCAN FIB-SEM instrument in the field of material, life and semiconductors sciences. All major types of TESCAN SEM and FIB technologies will be discussed along with the analytical capabilities of the instruments.