

# **In-situ TOF-SIMS and SPM: Providing true 3D chemical information on inorganic and organic surfaces.**

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Advances in analytical instrumentation and nanometrology have been the key to the remarkable progress in nanoscience and nanotechnology research over the last two decades. Detailed knowledge of the chemical composition, physical properties and the three dimensional structure of materials and devices at the nanometer scale is required in all phases of the development from exploratory research to concept and prototyping and finally manufacturing.

Time-of-flight secondary ion mass spectrometry (TOF-SIMS) is a very sensitive surface analytical technique. It provides detailed elemental and molecular information about surfaces, thin layers, interfaces, and full three-dimensional analysis of the sample. Inherent to all 3D TOF-SIMS data is a z-axis with a native time scale instead of a length scale. A starting topography of the initial sample surface as well as an evolving topography due to different erosions rates of the compounds cannot be identified by the technique and yields to relevant distortions.

Scanning force microscopy (SFM), has become the most versatile scanning probe microscopy (SPM) technique since its first application in 1986. In a scanning force microscope, a microscopic tip is scanned over the surface of interest and probes the local properties at each pixel of the scan region. Various tip-sample interaction forces can be mapped and thus different properties of the surface can be imaged. A SFM cannot only map topography up to atomic resolution; it can also map other sample properties with nanometer scale resolution such as local mechanical properties, materials contrast, or electric and magnetic stray fields emanating from the surface. These features make SFM the ideal technique to provide the necessary complementary information to a TOF-SIMS analysis.

In this contribution we will present our TOF-SIMS / SPM combination instrument and demonstrate the strength of this unique tool and its potential for a wide range of applications.