

3D NanoChemiscope

On 15th September 2008 the **3D NanoChemiscope** project started under the 7th Framework Program of the European Commission, with a total budget of 4 M€ and a duration of 4 years (2008-2012). This involves the collaboration of 8 European Institutions: ION-TOF (Germany), NanoScan (Switzerland), EMPA (Switzerland), PCPM-UCL (Belgium), LISE (Belgium), TU Wien (Austria), ISIRno (Czech Republic) and Holst Centre (The Netherlands). The objective of this project is to develop an innovative and novel combination of a new ToF-SIMS with substantially improved lateral resolution and sensitivity, combined with a new metrological high resolution SFM.

Time-of-flight secondary ion mass spectrometry is able to reveal detailed information on the surface chemistry of the sample and even three-dimensional chemical composition, however, the lateral resolution remains limited to a few tens of nanometers in the best case and a mapping of the topography is not possible. While various Scanning Force Microscopy operation modes were designed to obtain materials contrast on a nanometer scale, the unambiguous determination of the local surface chemistry remains difficult and limited to cases where prior knowledge of the sample composition is available. Hence, the SFM and ToF-SIMS techniques provide complementary information on nanoscale surface chemistry and surface morphology, and their respective limitations can be overcome with the combined instrument to be developed within this project.

This novel instrument will not only allow in-situ ToF-SIMS (chemical) and SFM (topography) analysis, but also include a controlled layer by layer material removal procedure using low energy sputtering and quantitative depth calibration by SFM. The proposed combined ultra-high vacuum (UHV) instrument is highly innovative and unique for the 3-dimensional chemical characterisation of nanostructured inorganic as well as organic materials with down to at least 10 nm lateral resolution and down to about 1 nm depth resolution. The development of the "3D NanoChemiscope" is expected to open broad multidisciplinary application areas.