

 Content archived on 2024-06-18



Combined SIMS-SFM Instrument for the 3-Dimensional Chemical Analysis of Nanostructures

Results in Brief

Analysis of 3D nanostructures

The characterisation of novel materials is critical for the development of new devices. Novel technology providing both structural and chemical information simultaneously at high resolution should significantly advance designs.



© Thinkstock

Understanding the properties of nanomaterials requires equipment whose resolution, sensitivity, accuracy and even type of information provided exceeds that available in many cases. This holds true for just about any field, from consumer electronics to biomedicine and energy and beyond.

Scanning force microscopy (SFM) provides detailed structural information with outstanding lateral resolution down to the atomic scale, but lacks the ability to provide chemical information. Chemical analysis techniques that use electron, photon or ion beams, such as time-of-flight secondary ion mass spectrometry (ToF-SIMS), are hampered by poor resolution and sensitivity for the analysis of nanostructures.

Scientists combined the techniques in a single instrument with EU funding of the

project 'Combined SIMS-SFM instrument for the 3-dimensional chemical analysis of nanostructures' (3D NANOCHEMISCOPE). For the first time ever, scientists can simultaneously have complementary information regarding nano-scale surface structure and chemistry.

The 3D NANOCHEMISCOPE system sports a high-precision five-axis stage (xyzrt positioning including Cartesian coordinates, rotation and translation) capable of positioning the sample and holding it in place rapidly and accurately. Layer-by-layer removal of nano-scale material in a controlled way is achieved by sputtering techniques. Modified high-resolution SFM measures the surface topography at various depths, while ToF-SIMS with lateral resolution down to 16 nanometres (nm) and improved surface sensitivity provides chemical information. In addition, depth profiling is possible without radiation damage and resulting loss of molecular information, as is common with other sputtering techniques. Software enables the calculation of a 3D display for all chemical species present.

The novel 3D NANOCHEMISCOPE enables a major breakthrough in organic depth profiling with unprecedented versatility for materials such as organic thin films and organic nanostructures. These materials are critically important in widespread applications, including sensors, biotechnology and optoelectronics. The project is thus expected to have important impact on the competitiveness of the EU economy in a variety of market sectors, and to position the EU as a leader in nano-scale measurement and characterisation.

Discover other articles in the same domain of application



Middleware system utilises AI to coordinate building energy management





Cell function profiling to assess clone stability in drug bioreactors



Access to materials modelling tools to boost industrial innovation



Real-time positioning delivers smarter manufacturing



Project Information

3D NANOCHEMISCOPE

Grant agreement ID: 200613

[Project website](#) 

Project closed

Start date

15 September 2008

End date

14 January 2013

Funded under

Specific Programme "Cooperation": Nanosciences, Nanotechnologies, Materials and new Production Technologies

Total cost

€ 5 284 260,20

EU contribution

€ 4 033 699,00

Coordinated by

Last update: 28 June 2013

Permalink: <https://cordis.europa.eu/article/id/91296-analysis-of-3d-nanostructures>

European Union, 2025