npSCOPE brings together partners from Luxembourg, Germany, Switzerland, the Netherlands, Belgium and France.

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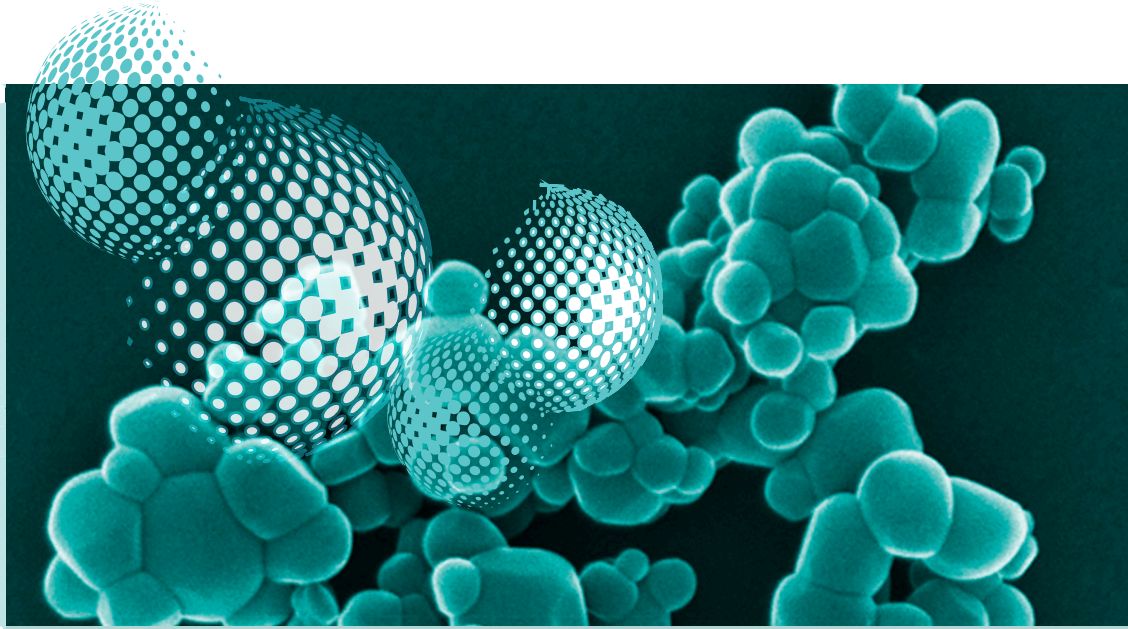


np SCOPE

The nanoparticle-scope

a new integrated instrument for accurate and reproducible physico-chemical characterisation of nanoparticles

The European project "npSCOPE: a new integrated instrument for accurate and reproducible physico-chemical characterisation of nanoparticles" aims to develop a new integrated and optimised instrument to provide a comprehensive physico-chemical characterisation of nanoparticles.

A tailor-made instrument and correlative data analysis software, it will have all the necessary capabilities to propose rapid, accurate and reproducible answers about the structural properties, composition and interaction of nanomaterials with their surroundings.

The npSCOPE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 720964.

European Commission

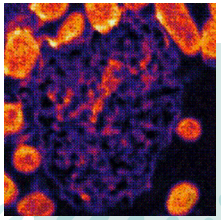
Improving nanomaterials risk assessment and technological innovations

In nanotechnology, the current trend is to modify materials in order for them to have certain desired properties. This approach increases the application of certain materials in different industrial sectors and thereby offers a broad spectrum of implementation possibilities. However, such alteration processes can generate new materials with potentially unknown health risks to humans, animal and plant species, and to the environment in general. The risk is even more concerning given the fact that nanomaterials are omnipresent both around us and inside us. Nearly 2000 consumer products are concerned, in the areas of food, cosmetics, textiles, paints and electronic devices, to name just a few examples.

To identify the risks, nanomaterials are physically and chemically characterised. However, the current approach employs a variety of techniques and separate instruments, making nanomaterial characterisation an expensive and time-consuming process.

The npSCOPE instrument has several potential applications beyond those for nanomaterial risk assessment. Examples include analytical medical imaging and medical diagnosis, the study of the ageing of materials under stress (temperature, mechanical, chemical, radiation, etc.), materials analysis for semiconductor industry and anti-counterfeiting in the cosmetics sector

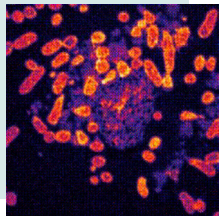
> "The aim of the npSCOPE project is to improve the efficiency of the nanomaterial characterisation workflow. This can be done with an innovative tool that integrates several techniques into one instrument and thus provides more efficient, comprehensive and accurate data."



What is exactly a nanomaterial?

According to the European Union Commission Recommendation of 18 October 2011 on the definition of nanomaterial:

A nanomaterial is considered a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm - 100 nm.



One single instrument for nanoparticle characterisation

The npSCOPE project intends to develop an instrument that couples the ultra-high resolution of the helium-ion microscope with:

- a mass spectrometer for chemical analysis;
- a transmission ion detector for 3D visualisation.

Thanks to quick and concise analyses of nanomaterials that are embedded in complex matrices (e.g. biological tissue, liquid, composite material, etc), the instrument will offer two main advantages:

- a better understanding of nanoparticle toxicity for human health or the environment;
- understanding of nanoparticle risk, a comprehensive characterisation of individual nanoparticles and their interaction with a complex environment (water, soil, body fluid, cells and tissues, whole organisms, etc.);
- better characterization leads to improved in silico models for NM risk assessment and to nano-enabled product development with improved properties.

What will npSCOPE focus on?

To reach its ultimate goal, the project will focus on developing:

- hardware based on the Gas Field Ion Source (GFIS) as a unique key enabling technology for the in situ real-time correlation of Scanning Transmission Helium Ion Microscopy (STIM), Secondary Electron (SE) imaging and Secondary Ion Mass Spectrometry (SIMS) in one single instrument;
- imaging in cryo conditions that will allow analyses of interactions between nanomaterials and biological systems close to the native state. This will enable sample preparation artefacts to be avoided and will provide valid data;
- protocols for sample preparation and instrument operation, as well as correlative methodologies and software tools for the automatic and accurate correlation of high-sensitivity and high-resolution chemical data with morphological information obtained at 0.5 nm resolutiwhe developed instrument;
- go-to-market strategies for the developed instrument, taking into account aspects such as performance criteria, cost, ease of use, level of automation, intellectual property and freedom to operate.