VAMAS

Surface Chemical Analysis

Technical Work Area 2

Call for Participation

Project A50

Determination of shell thickness and chemistry of core-shell nanoparticles using X-ray photoelectron (XPS) spectroscopy

Objectives

◦ To validate an XPS-based measurement protocol for measuring the shell thickness and chemistry of core-shell nanoparticles.
◦ Support revision and development of ISO/TR 23173 into a full ISO standard.

Background

Core-shell nanoparticles are increasingly used in advanced applications such as drug delivery, diagnostics, catalysis, and energy storage. Their performance and safety are critically influenced by the chemical composition and thickness of their surface coatings. However, reliable and standardised methods for measuring these properties are lacking.

Current guidance, such as ISO/TR 23173:2021, are only informative and lack normative protocols. This gap hinders industrial development

A SMURFnano project is addressing this need by developing validated, traceable XPS-based for measuring shell thickness and composition on real-world core-shell nanoparticles.

The international interlaboratory comparison (ILC) of this call will be used to validate the performance of developed protocols and enable reproducibility assessment and uncertainty quantification.

The results will support the revision of ISO/TR 23173 and contribute to the development of a full ISO standard under ISO/TC 201.

This work also aligns with a proposed pilot studies under BIPM CCQM SAWG, helping to establish reference materials and methods for nanoparticle surface analysis.

Standardization Needs

The project will help validate a protocol for the determination of shell thickness and chemistry of core/shell nanoparticles. This protocol will be used to revise ISO/TR 23173:2021 under ISO/TC 201 as a full international standard.

Work Programme

Selection and preparation of core-shell nanoparticle samples for the ILC is ongoing.

Development and refinement of an XPS protocol is also underway.

Four samples are planned to be sent to participants, likely consisting of two to three thicknesses of gold-silica core shell nanoparticles along with one Lathanide nanoparticle sample. The samples will be sent along with a protocol and a reporting sheet.

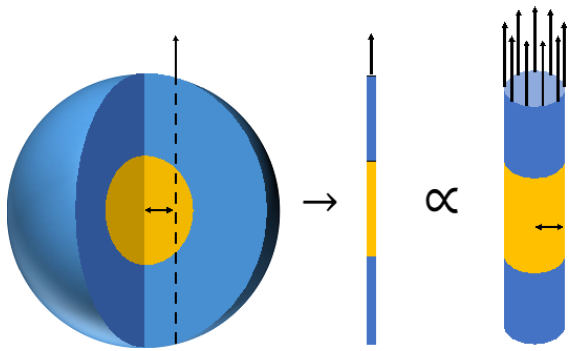

Figure: Iillustration of how the geometry of a core–shell nanoparticle influences XPS signal interpretation.

The results of ILC will be analysed, circulated to participants before being written up as a peer-reviewed publication. The reproducibility and uncertainty of the results will be analysed.

Deliverables and Dissemination

The interlaboratory study will be delivered. If successful, this will lead to a peer-reviewed publication. Presentations at national and international conferences based on the ILC results are also expected.

Funding

Participants fund their own involvement in the project. Anticipated work is ≈ 3 days.

Status

The project will launch in Q4 2025. Experts are invited to participate.

For more information:

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