VAMAS

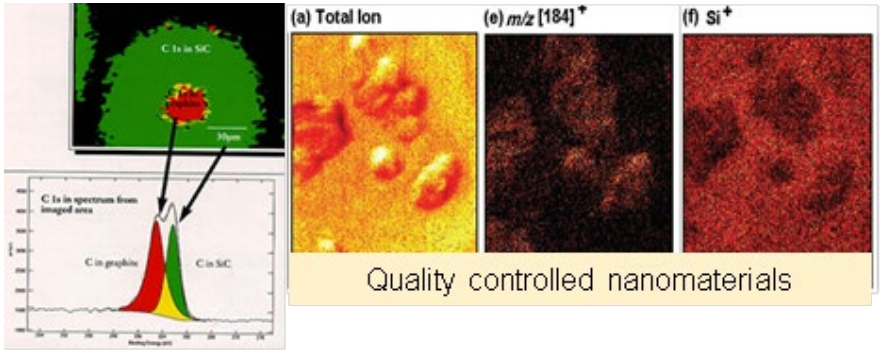
Surface Chemical Analysis

Technical Work Area 2

Call for Interest

Project A46

Spectroscopic Imaging of Nanomaterials by Surface Analysis Methods



Objectives

◦ Determine international interest for standardization of spectroscopic chemical imaging for core/shell nanomaterial characterization.

◦ Developed activities in the project will include identification and preparation of suitable test samples and procedures, determination of measurement repeatability and uncertainties across laboratories.

Background

Mass production of nanomaterials in industrial fields requires a large variety of physicochemical characterizations. One great concern is measuring the chemical bonding within core/shell nanomaterials for quality control and potential degradation with time. Unfortunately, no validated chemical analysis tool and method are available yet for the individual particle detection level. As an alternative, spectroscopic chemical imaging using surface analysis techniques with micrometer resolution is proposed as a potential method for standardized evaluation.

It is anticipated that such methods can provide statistical assessment of the chemical bonding information for core/shell nanomaterials and their quality control.

Standardization Needs

The motivating need of this effort is a methodology for measuring chemical bonding before and after exchange of core/shell nanomaterials, which is a frequent procedure for various industrial purposes. There are several standards for nanomaterial measurement but no validated existing standard method(s) for determining chemical information of core/shell bonding.

The anticipated usage of a documentary standard for these measurements is high, given the large volume of nanomaterial production and related development work worldwide both in academic and industrial organizations

Work Programme

Procedures for assessment of chemical bonding will be developed for several techniques, including:

- Elemental distribution by XPS imaging
- Distribution of molecular fragmentation by TOF-SIMS
- MALDI-TOF
- Soliciting other technique suggestions

Statistical analysis of the results from participants will be conducted as consistent with ISO/TS 5725.

Deliverables and Dissemination

◦ Development of procedures for assessment of chemical bonding on core/shell nanoparticles.

◦ Potential ILC to evaluate developed protocols.

Funding

Participants fund their own involvement in the project.

Status

◦ Independent tests of XPS and TOF-SIMS, and their image analysis were developed and published.

◦ Feasibility tests of the above imaging analysis method are under progress.

◦ Looking for interested partners for an interlaboratory study.

References

Kim, J.W. *et al.*, *Surf. Interface Anal.* **2014**, 46: 193-196. DOI 10.1002/sia.5404

Son, J.G. *et al., Nanoscale* **2016,** 8(8):4573-8. DOI: 10.1039/c5nr07592k

Contact information:

Project Leaders:

Dr. Jeong Won Kim
Korea Research Institute of Standards and Science (KRISS), Korea
jeongwonk@kriss.re.kr

Dr. Tae Geol Lee
Korea Research Institute of Standards and Science (KRISS), Korea
tglee@kriss.re.kr

TWA Chair and Vice-Chair:

Prof. Ian Gilmore
National Physical Laboratory, UK
ian.gilmore@npl.co.uk

Dr. Charles Clifford
National Physical Laboratory, UK
charles.clifford@npl.co.uk

www.vamas.org

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