



Graphene and Related 2D Materials

Technical Work Area 41

Project 11

Determination of disorder and number of layers of graphene flakes by Raman Spectroscopy

Objectives

- Validate a methodology for the determination of disorder and number of layers of graphene flakes deposited on Si/SiO₂ substrates, using Raman spectroscopy;
- Determine the uncertainties associated with the measurement and data analysis;
- Input into ISO TC229 JWG2, for ISO/TS 21356-1 'Structural Characterisation of Graphene'.

Background

Graphene is predicted to impact many different application areas such as solar cells, biosensors, displays, composites, flexible electronics and energy storage due to its exceptional properties. One of graphene's many achievements is that it is the first truly two-dimensional material to be synthesised, being only one atom thick. The isolated research into a whole new family of other 2D materials has indicated that these new materials show exciting properties complementary to graphene, revealing potential for many other industry applications.

Standardization Needs

There are currently over 100 commercial 'graphene' producers worldwide, including leading graphene producers in Europe, with an 'on paper' offering of materials with vastly different properties and types.

However, many suppliers (and buyers) are hindered due to uncharacterised material that can be more often than not ascribable to graphite rather than graphene, or have high batch to batch variations.

On the other hand, standards cannot be developed without proven and verified methodologies. Normative documentary standards are based on methods or procedures developed through interlaboratory studies and verified internationally.

With this project and the resultant standard, the entire supply chain of graphene from manufacturers to application builders and consumers will profit from clear material specifications and globally accepted characterisation standards. The suppliers will see a stable demand for their high value high quality products. Application builders will profit from reliable and traceable materials supply as well as comparability and traceability of various parameters to metrological standards. This will further enhance the development of advanced graphene applications, and consumers will ultimately profit with greater choices of technology, as well as reliable functionality due to well-specified materials used in the products. The impact is therefore on the entire supply chain and it does not depend on the graphene price or application hype in the market.

CALL FOR PARTICIPATION



Work Programme

Graphene flakes deposited onto Si/SiO₂ substrates will be used for Raman spectroscopy measurements. Samples will be sourced in the framework of the EMPIR project [ISO-G-SCoPe](#) and provided to each participant following a preliminary study for defining the optimal conditions for the Raman spectroscopy measurements.

Deliverables and Dissemination

This interlaboratory study will be disseminated in a peer-reviewed scientific journal, and used to contribute to "ISO TS 21356-1 Nanotechnologies. Structural characterisation of graphene: Part 1: Graphene from powders and dispersions", focusing on the standardisation of the measurement methods.

International Participation

Current participation includes volunteers from Italy, UK, and Spain. More volunteers are welcome.

Funding

Participants fund their own involvement in the project.

Status

The project is in progress with a duration of 18 months for completion.

For more information:

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