



VAMAS

## Surface Chemical Analysis

Technical Work Area 2

### Project A33

### Chemical composition of functionalized graphene with X-ray photoelectron spectroscopy (XPS)

#### Objectives

- Validate methodology for chemical characterisation of functionalized graphene using X-ray photoelectron spectroscopy (XPS);
- Determine the uncertainties associated with the measurement and data analysis;
- Input into ISO TC 229 JWG2, for [ISO/AWI TS 23359](#) 'Chemical characterisation of graphene related 2D materials in powders and suspensions'.

#### 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, being only 1 atom thick. The isolated research into a whole new family of other 2D materials has indicated that the new materials show exciting and complementary properties to graphene, revealing potential for many other industry applications.

#### Standardization Needs

As industry uptake on this material increases, international standardization is critical to enable commercialization. Reliable, accurate, and reproducible measurements are important due to the multiple production routes and producers of the material in order to maintain quality in manufacture.

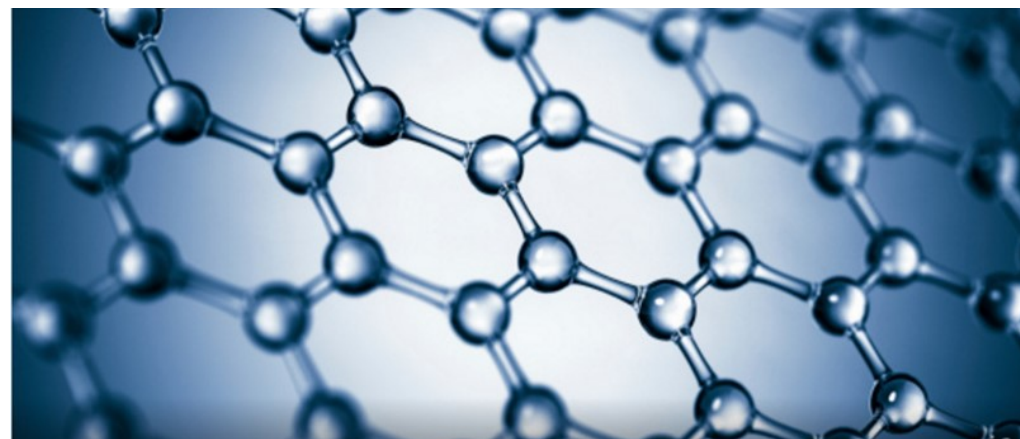
Several standards are under development within ISO TC229 which will focus on determining the chemical composition of functionalized graphene flakes (O-, N- and F functionalized) in bulk form (i.e. powder).

This will require international interlaboratory comparisons to help develop best practice and understand the associated uncertainties.

#### Work Programme

- Representative samples (4) of selected materials (raw graphene, O-, N- and F-functionalized graphene) have been sourced by an industrial collaborator.
- Samples will be provided to each participant for XPS measurements.

## CALL FOR PARTICIPATION



#### Deliverables and Dissemination

This interlaboratory study will be disseminated in a peer-reviewed scientific journal, and used to develop ISO/AWI TS 23359 (Nanotechnologies - Chemical characterisation of graphene related 2D materials in powders and suspensions).

#### International Participation

Current participation includes volunteers from Asia and Europe. More volunteers are welcome.

#### Funding

Participants fund their own involvement in the project.

#### Project Status

The samples and measurement protocol will be despatched to the participants following an internal validation exercise that is currently in progress.

#### For more information:

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