

## Projects 2 and 3

### Chemical composition of graphene flakes: Elemental Analysis, Oxygen content, Metal Impurities

## Objectives

- Validate methodology for characterising the oxygen content and metal impurities of graphene flakes in a powder form, using X-ray photoelectron spectroscopy (XPS) and Induced coupled plasma-mass spectrometry (ICP-MS).
- Determine the uncertainties associated with the measurement and data analysis.
- Develop a new Preliminary Work Item (PWI) within ISO/TC 229 JWG2.

## 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 in order to maintain quality, considering that there are multiple production routes and producers of the material.

Several standards are under development within ISO TC 229 'Nanotechnologies', jointly with IEC, that are focussed on the measurement of specific properties of graphene produced through different methods. There is currently a need for measurement standards that address the determination of chemical properties.

## International Participation

Current participation includes volunteers from Australia, Brazil, China, UK and USA. More participation is welcome.

## Call for Participation

### Work Programme

The graphene will be sourced by an industrial collaborator. The samples will be prepared by the project leadership and despatched to each participant following a normalisation study and assessment.

#### Project 2

**Title:** Elemental analysis and oxygen content of a graphene powder

**Abstract:** Functionalized and unfunctionalized graphene flakes/powders will be used for **XPS** measurement.

#### Project 3

**Title:** Measurement of the Metal impurities of a graphene powder

**Abstract:** The measurement will be undertaken by **ICP-MS**.

## Project Status

Approved for start-up by the VAMAS Steering Committee.

Both projects are due to start in March 2017 for a duration of 16 months.

**For more information on participation, please contact:**

### TWA Co-Chairs

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