



# Graphene and Related 2D Materials

Technical Work Area 41

## Project 5 Thickness measurement of graphene oxide flakes using atomic force microscopy (AFM)

### Objectives

This project aims to validate the methodology for measuring the thickness of graphene oxide (GO) flakes using atomic force microscopy (AFM).

The uncertainties associated with both the measurement and data analysis will be assessed.

### Background

Graphene and related 2D materials have exceptional properties and development potential in a wide range of application areas. The thickness of a flake is indicative of the number of layers and thus affect the electrical, thermal and optical properties of graphene products.

AFM is a powerful technique for the measurement of flake thickness. However, although the theoretical value of single-layer graphene oxide is understood, uncertainties due to contaminants and instrument noise may be too large for the thickness to be accurately measured.

### Standardisation Needs

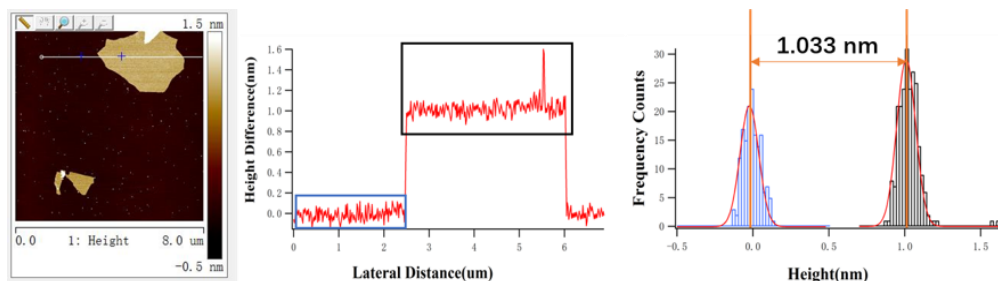
There are currently no internationally recognized standards for thickness measurements of GO flakes using AFM.

As industry uptake of 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. If the data from the methods are reproducible, future international standardization can be considered.

### Work Programme

Samples will initially be prepared by the project team and dispatched to each participant.

AFM measurements combined with a histogram method for reliable measurements of GO thickness will proceed in the following stages:



1. AFM topographical image of GO flakes.
2. AFM image analysis and height profile data processing.
3. Height frequency analysis and histogram fitting. The thickness of GO flakes can be measured by the distance between two fitted height frequency histogram peaks.

### International Participation

Current participation includes volunteers from Australia, Brazil, China, France, Spain, UK and USA. More volunteers are welcome

Additional volunteers for participation are welcome.

### Funding

Participants fund their own involvement in the project.

### Deliverables and Dissemination

- Development of experimental methods for thickness measurement
- Publication in a scientific journal
- VAMAS Technical Report
- Submission of drafts to be considered for future international standardization (via ISO TC 229).

**To register your interest to participate, please contact:**

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