

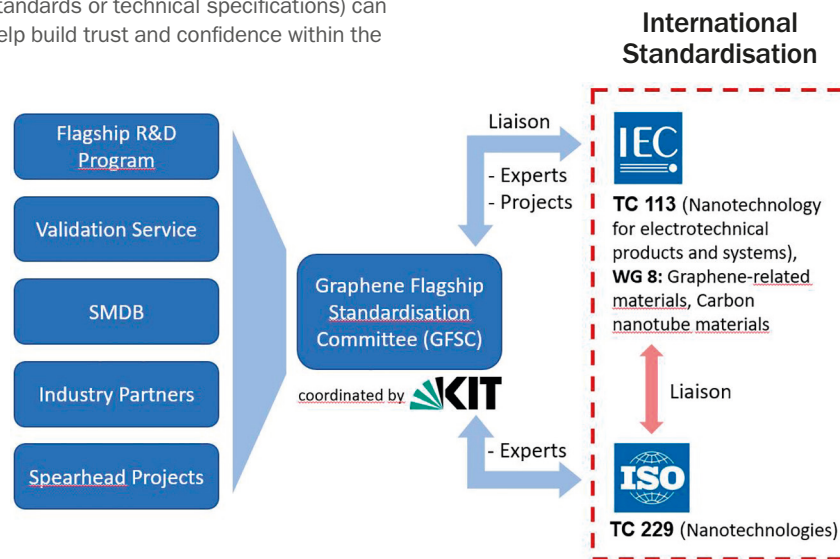
## GRAPHENE FLAGSHIP STANDARDISATION COMMITTEE

The GFSC connects the activities within the Graphene Flagship with international standardisation in both the International Organization for Standardisation (ISO) and the International Electrotechnical Commission (IEC).

The GFSC has initiated numerous projects with the IEC via their Technical Committee 113 (Nanotechnologies for Electrotechnical Products and Systems). The resulting published documents (international standards or technical specifications) can help build trust and confidence within the

industry and thereby can facilitate the commercial adoption of graphene technologies.

Since the beginning of the Graphene Flagship, the GFSC has worked towards defining key control characteristics (KCCs) of graphene and related materials and formulating standardised methods for their measurement.



## CONTACT & LINKS



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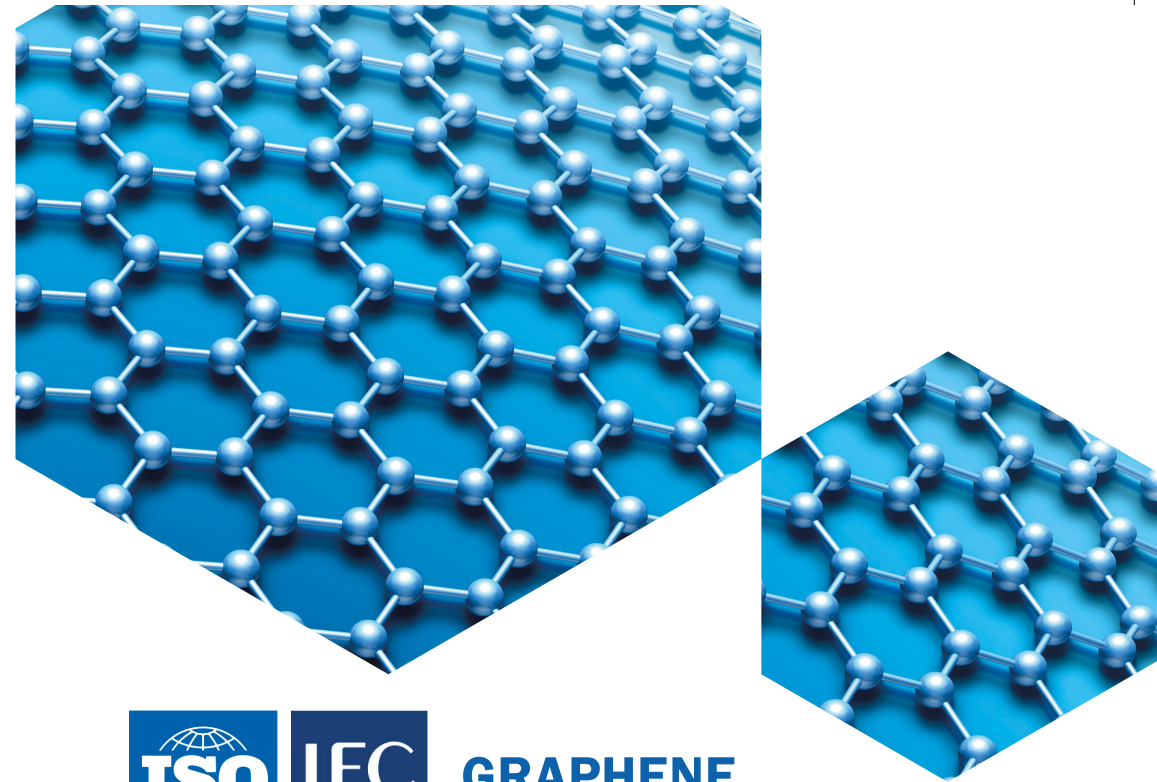
### Technical Committees in IEC and ISO:

IEC TC 113 (Nanotechnologies for electro-technical products and systems)

<https://www.iec.ch/dyn/www/f?p=103:7:30472647022988>

ISO TC 229 (Nanotechnologies)

<https://www.iso.org/committee/381983.html>



## GRAPHENE STANDARDISATION

The Graphene Flagship standardisation team works towards establishing consensus-based international standards in the field of graphene and related materials that will help stimulate innovation and market penetration.

The further commercialisation of materials and technologies based on graphene and related materials as well as the establishment of robust, underlying value networks remain a challenge. Industry has identified the lack of standardised materials, processes and characterisation impeding methods as one important factor slowing down innovation in the field.

This brochure gives you an overview of international standardisation, the activities of the Graphene Flagship Standardisation Committee (GFSC), graphene-related projects in IEC and ISO and the benefits of participating in developing standards as a tool for innovation.

## STANDARDISATION IN A NUTSHELL

### What is a standard?

A standard is a document, established by consensus and approved by a recognised body, that provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context (EN 45020)

### Why make standards?

When applied in your organization, standards can help

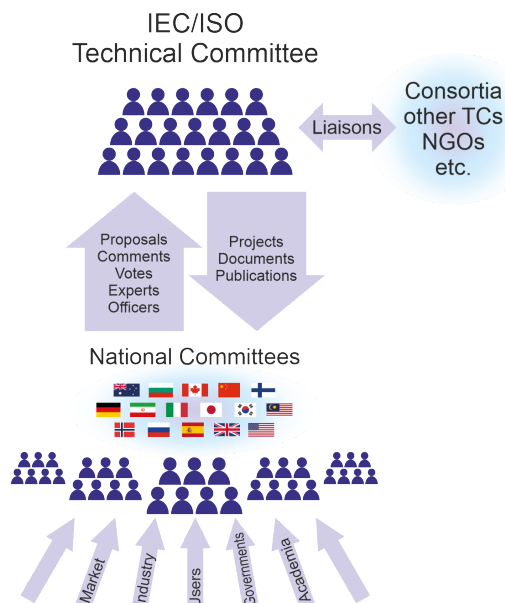
- Catalyse innovation
- Increase efficiency and lower costs
- Guarantee compatibility and quality, and improve market access
- Lower liability risks
- Reduce business and trade barriers and simplify customer-supplier negotiations

By participating in standardisation, you can

- Represent your own interests
- Gain knowledge advantage and watch your competitors
- Interact and exchange knowledge with international experts
- Contribute to self-organization of the business community

### Who makes standards?

On the international level, standards are developed under the roof of recognised standardisation bodies such as IEC, ISO, IEEE, ASTM Intl. and the W3C consortium. Graphene-related activities take place in IEC and ISO, where experts, i.e. delegates of the participating national committees and representatives of accepted organizations and consortia (including the Graphene Flagship), participate in projects of two Technical Committees (TCs): IEC TC113 ("Nanotechnologies for electrotechnical products and systems") and ISO TC229 ("Nanotechnologies").



### How to get involved?

If you think graphene standardisation is an important topic for you and your organization, there are several ways to get involved:

- Get in touch with the National Committee of your home country that mirrors the activities of IEC TC113 and ISO TC229. In Europe, such National Committees are managed by National Standardisation Organisations such as AENOR (Spain), AFNOR (France), BSI (UK), DIN (Germany), NEN (Netherlands), SN (Sweden) or UNI (Italy), to name a few.
- Become a member of the Graphene Flagship Standardisation Committee (GFSC) and join IEC TC113 via an established liaison. (See back page!)
- Contact colleagues who are active in standardisation and provide them with input and feedback with regard to running projects, technology trends, standardisation needs.
- Make use of the public voting and commenting procedures that both IEC and ISO have to offer.

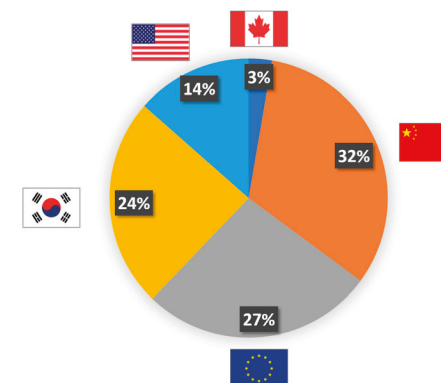
## GRAPHENE STANDARDISATION NEEDS AND BENEFITS

Industry has identified the lack of standardised materials and characterisation methods as one important factor slowing innovation in the field of graphene. The issue can be illustrated by two questions: "What properties of graphene or a related material do I need to know and control in order to reliably achieve the desired function in my application?" and "Who can guarantee that their raw material meets my specifications in every single production batch?"

Already the first question is often surprisingly hard to answer, e.g., in case of polymer composites using graphene as a filler, where flake size, surface functionalisation, lattice defects, aggregation behaviour, material processing, and many other factors have a decisive impact on the performance of the composite. Finding the right supplier in such a case may be an additional challenge.

Standardisation lays the basis for solving such issues. It will help enable better quality control, improve reliability and trust, and lower one of the key barriers to graphene innovation and commercialisation.

“ While well-accepted standards exist for most application areas and products envisaged for graphene and related materials, according to industry, standards are sorely lacking in the area of material characterisation and processing. ”



International participation in project leadership within IEC TC113's Graphene-related standardisation projects

## GRAPHENE STANDARDISATION TODAY

Work on standards in the field of graphene and related materials is focussed on

- Characterisation methods
- Sample preparation
- Data analysis
- Terminology

Over 35 projects leading to standards or technical specifications. Various measurement and characterisation methods are being addressed, including:

- Level of disorder, number of layers (Raman)
- Specific surface area (BET)
- Structural properties (TEM, SEM, AFM)
- Electrical properties (various methods)

Within accompanying projects (EMPIR, VAMAS), interlaboratory comparisons and round-robin tests are conducted, and new methods are developed.

An overview of running projects can be found by following the links on the back page.

