Developing future technical standards for the metrology of electrical properties of graphene


1INRIM - Istituto Nazionale di Ricerca Metrologica, Turin - Italy
Main Objectives

Validated Protocols for electrical characterization of graphene

Good Practice Guides

Technical Specification drafts to International Electrotechnical Commission
- 36 months project started in mid 2017
- Budget 600 k€

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EMPIR

The European Metrology Programme for Innovation and Research, part of Horizon 2020, the EU Framework Programme for Research and Innovation.

EMPIR Targeted Programs

- EMPIR calls, launched between 2014 and 2020
- Total budget 600 M€
- Article 185 of the European Treaty

EUROPEAN ASSOCIATION OF NATIONAL METROLOGY INSTITUTES
In summary

Validated and traceable protocols for the measurement of sheet resistance, carrier mobility and concentration, work function.

Technical Specifications drafts to IEC
GRACE
SAMPLES

CVD graphene grown on copper

quartz wafer

graphene transferred on quartz

diced samples 1 cm x 1 cm
Samples will circulate among the partners for multiple characterisation.

**Contact methods**
- in-line four-contact probe
- van der Pauw method
- Electrical Resistance Tomography
- CoPlanar Waveguides

**Non-contact methods**
- Scanning Kelvin Probe Microscopy
- Microwave Resonant Cavity
- Time Domain terahertz Spectroscopy

**Chemical Vapour Deposited graphene**

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GRACE METHODS

- Preliminary results
  - Chemical Vapour Deposited graphene

Contact methods
- in-line four-contact probe
- van der Pauw method
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Fast throughput

Preliminary results show good match between very different methods.

Other available methods, measurements still ongoing.

Future work: new tests on different substrates, production-line testing of fast throughput methods, uncertainty expression.

IEC will receive technical specifications drafts from the partners.
Developing electrical characterisation methods for future graphene electronics

Find more info and the publishable summary at:

http://empir.npl.co.uk/grace/project

Interested in joining as stakeholder/collaborator?
Mail to < a.cultrera@inrim.it >

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