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Nanomanufacturing – Key control characteristics – Part 6-9: Graphene-based material – Sheet resistance: Eddy current method

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NANOMANUFACTURING – KEY CONTROL CHARACTERISTICS –

Part 6-9: Graphene-based material – Sheet resistance: Eddy current method

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IEC TS 62607-6-9 has been prepared by IEC technical committee 113: Nanotechnology for electrotechnical products and systems. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
113/569/DTS	113/625/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available

at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC TS 62607 series, published under the general title *Nanomanufacturing – Key control characteristics*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The application of graphene and graphene-related materials as a conductive large-area electrode material has become of rising interest during recent years. Especially in the application of graphene as a replacement material for indium tin oxide (ITO), graphene combines low sheet resistance and high optical transparency. In particular, the application of optically transparent large-area graphene layers has become more important. Hence, the electrical characterization of large-area graphene layers is essential.

However, contacting methods, such as four-probe measurements, can cause damage to the graphene and deteriorate its quality.

Non-contact methods have advantages for measurement of the sheet resistance since damage to the layers is avoided and it is possible to readily scan the film to examine homogeneity.

The sheet resistance can serve as a measure for the electrical characterization due to its direct dependence on conductivity and graphene quality for electrical applications.

NANOMANUFACTURING – KEY CONTROL CHARACTERISTICS –

Part 6-9: Graphene-based material – Sheet resistance: Eddy current method

1 Scope

This part of IEC 62607 establishes a standardized method to determine the key control characteristic

- sheet resistance

for films of graphene-based materials by

- eddy current method.

With this method a coil-generated primary alternating electromagnetic field induces eddy currents in the conducting layer to be measured. The superposition of the primary field with the secondary field induced by the eddy currents is a function of the sheet resistance of the layer.

– The method is applicable for the contactless measurement of the sheet resistance of large area graphene layers on non-conductive substrates. As the method avoids any physical contact, it prevents any mechanical damage to the sensitive graphene layer. Therefore, the method is suitable for electrical characterization and quality control in an industrial fabrication environment.

– Due to the use of two detectors – one above the substrate and one below the substrate – the method is insensitive regarding small deviations from perfect flatness of the substrate.

– The range of graphene layers to be characterized comprises any quality, size and morphology of graphene crystallites. Hence, the applicability of this method spans from high quality, defect-free graphene layers to layers of dried graphene ink.

– The size of the graphene layers to be characterized includes layers larger than 25 mm × 25 mm for single point testing and 50 mm × 50 mm for imaging testing.

– The method can be used for layers of graphene-based material with a sheet resistance in the nominal range of 10 Ω/sq to 5 000 Ω/sq.

2 Normative references

There are no normative references in this document.