
**Nanotechnologies — Matrix of
properties and measurement
techniques for graphene and related
two-dimensional (2D) materials**

*Nanotechnologies — Matrice des propriétés et des techniques de
mesure pour le graphène et autres matériaux bidimensionnels (2D)*





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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Graphene is a single layer of carbon atoms with each atom bound to three neighbours in a honeycomb structure^[1]. Since its discovery in 2004^[2], graphene has become one of the most attractive materials in application research and device industry due to its supreme material properties such as mechanical strength, stiffness and elasticity, high electrical and thermal conductivity, optical transparency, etc. It is expected that applications of graphene could replace many of current device development technology in flexible touch panel, organic light emitting diode (OLED), solar cell, supercapacitor, and electromagnetic shielding. To gain deeper understanding of the material properties and to find the ways of mass producing with fine quality, much research on graphene, and similarly on related two-dimensional (2D) materials is being done in universities, research institutes, and laboratories around the globe. However, to lead these revolutionary materials to full commercialization, it is essentially demanded that characterization and measurement techniques for important material properties need to be standardized and globally recognized. In this document, characterization and measurement techniques for particular properties of graphene and related 2D materials which need to be standardized are organized in a form of a matrix. The matrix could serve as an initial guide for developing the necessary international standards in characterization and measurements of graphene and related 2D materials.

Nanotechnologies — Matrix of properties and measurement techniques for graphene and related two-dimensional (2D) materials

1 Scope

This document provides a matrix which links key properties of graphene and related two-dimensional (2D) materials to commercially available measurement techniques. The matrix includes measurement techniques to characterize chemical, physical, electrical, optical, thermal and mechanical properties of graphene and related 2D materials.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 80004-13, *Nanotechnologies — Vocabulary — Part 13: Graphene and related two-dimensional (2D) materials*