Technical Specification

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Nanotechnologies — Classification framework for graphene-related 2D materials

Nanotechnologies — Cadre de classification pour les matériaux bidimensionnels similaires au graphène

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Foreword

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This document was prepared by Technical Committee ISO/TC 229 *Nanotechnologies*.

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Introduction

This document aims to provide commercial graphene producers and users with a standardized approach to classifying graphene-related 2D materials. It outlines a transparent methodology for categorizing these materials in any form, regardless of production methods or source materials. This approach facilitates accurate and straightforward comparisons between materials from different suppliers. Additionally, the document serves as a foundation for material specification data sheets, proposing a minimum set of relevant data that can be consistently used by producers, users, and regulators. Material characteristics deemed most critical for commercial applications—such as layer count, thickness, lateral flake size, disorder level, and specific surface area—can be identified using standard testing methods and documented in material data sheets.

The framework is primarily intended to support the creation and use of technical data sheets for specific forms of graphene-related 2D materials. It is not designed to prescribe production procedures or quality control testing processes, although some of the described test methods can serve as supporting techniques for those purposes.

Establishing a systematic classification framework for graphene-related 2D materials is essential for several key reasons. First, it ensures consistent and reliable regulation and registration processes, fostering transparency and trust in the market for both producers and users. Second, it enables a thorough understanding and quantification of material properties, forms, and contaminants. Finally, the adoption of universal standardized testing methods is critical for enabling easy, quantitative comparisons of data generated by different laboratories and users globally. This systematic approach will significantly advance the responsible development and use of graphene-related 2D materials.

It is also important to note that certain test methods are possibly not suitable for all forms of graphene-related 2D materials. When employing standardized testing methods, it is beneficial to provide multiple measurement techniques for evaluating different properties. However, these methods can yield varying results for the same sample due to differences in how each technique assesses specific aspects of the material.

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