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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 30544.13-2018

Nanotechnologies -- Vocabulary -- Part 13: Graphene and related two-dimensional (2D) materials

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Foreword

GB/T 30544 "Nano Technology Terminology" is divided into the following sections.

--- Part 1. Core terminology;

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--- Part 3. Carbon nano-objects;

--- Part 4. Nanostructured materials;

--- Part 5. Nano/biological interface;

--- Part 6. Characterization of nano-objects;

--- Part 8. Nanofabrication process;

--- Part 13. Graphene and related two-dimensional materials.

This part is the 13th part of GB/T 30544.

This part is drafted in accordance with the rules given in GB/T 1.1-2009.

This section uses the translation method equivalent to ISO /T S80004-13.2017 "Nanotechnology terminology Part 13. Graphene and phase

Off two-dimensional materials.

This part was proposed by the Chinese Academy of Sciences.

This part is under the jurisdiction of the National Nanotechnology Standardization Technical Committee Nanomaterials Subcommittee (SAC/TC279/SC1).

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Introduction

Because graphene has many excellent properties (such as electrical conductivity and thermal conductivity), it has caused people both academically and commercially in the past decade.

They are of great interest. Recently, other materials with similar graphene structures have also shown good performance, for example, single layer and few layers of hexagonal nitrogen.

Boron (hBN), molybdenum disulfide (MoS2), tungsten diselenide (WSe2), silicene, germanene, and mixtures of these materials

a layered assembly of matter. The thickness of these materials is limited to nanometers or smaller and consists of one layer to several layers. Because these materials have a dimension

Degrees are on the order of nanometers or smaller, while the other two dimensions are usually larger than the nanoscale and are therefore referred to as two-dimensional (2D) materials. Layered material is made up of

A two-dimensional layer in which these two-dimensional layers form a three-dimensional structure by weak stacking or weak bonding. Figure 1 shows two-dimensional materials and

graphite

An example of a different stacking structure in aene. It should be noted that the two-dimensional material in reality does not have to have a flat topography, and there may be warped knots.

And can further form aggregates and agglomerates with different morphologies. Two-dimensional materials are an important part of nanomaterials.

a) A variety of two-dimensional materials consisting of different elements and structures (in different colors of the ball, top view, side to try to show)

b) Bernal stacking bilayer graphene (3.1.2.6) c) chaotic layered graphene or twisted bilayer graphene with relative stacking angle (3.1.2.7)

Figure 1 Two-dimensional material and different stacking structures of graphene layers

d) Bernal stack (AB stack) (3.4.1.10) three-layer graphene (3.1.2.9)

And rhombohedral stack (ABC stack) (3.4.1.11) three-layer graphene (3.1.2.9)

Figure 1 (continued)

It is important to standardize graphene, derived from graphene and related two-dimensional materials at the international level, and their related publications,

The number of patents and organizations is rapidly increasing, and they are also being commercialized and sold worldwide, so these two-dimensional materials need one

The terminology.

This section is one of a series of terminology standards for different aspects of nanotechnology. This part is based on GB/T 30544.3,

ISO /T S80004-6 and ISO /T S80004-11 are compiled and used as much as possible.

Nanotechnology terminology

Part 13. Graphene and related two-dimensional materials

1 Scope

This part of GB/T 30544 defines the terms and definitions of graphene and related two-dimensional materials, including preparation methods, characteristics and

Characterization.

This section aims to promote industry, government organizations, members of society and related parties related to graphene and related two-dimensional materials in research,

Inter-exchange in the process of industrialization.

2 Normative references

There are no normative references in this section.

3 Terms and definitions

The following terms and definitions apply to this document.

The terminology database covered in the ISO and IEC standardization process can be accessed at the following URL.

3.1.1 General terms related to 2D materials

3.1.1.1

Two-dimensional material; two-dimensional material; 2Dmaterial

Consisting of one layer (3.1.1.5) or several layers (3.1.1.5), in which the atoms in each layer are tightly bonded to adjacent atoms in the layer.

There is one dimension (ie its thickness) at the nanometer or smaller scale, and the remaining two dimensions are usually at a larger scale.

Note 1. The number of critical layers that distinguish two-dimensional materials from bulk materials is related to the material to be tested and its properties. For the number of graphene layers (3.1.2.1), from electrical testing

In other words, when the thickness is less than or equal to 10 layers, it is a two-dimensional material. When the thickness is greater than 10 layers, it has been combined with the bulk material, that is, graphite (3.1.2.2).

the difference.

Note 2. The interlayer bonding is significantly different and weaker than the intralayer bonding.

Note 3. Each layer can contain multiple elements.

Note 4. Two-dimensional materials can be nanosheets (3.1.1.2).

3.1.1.2

Nanosheet nanoplate

The outer dimensions of one dimension are on the nanometer scale, and the outer dimensions of the other two dimensions are significantly larger than the nanoscale objects of the smallest dimension.

Note 1. Larger external dimensions do not have to be on the nanometer scale.