ICS 07.120
CCS A42

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 30544.12-2023

Nanotechnologies - Vocabulary - Part 12: Quantum phenomena in nanotechnology

纳米科技 术语 第12部分：纳米科技中的量子现象

Issued on: May 23, 2023 **Implemented on: December 1, 2023**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules for Standardization Documents" drafting: This document is part 12 of GB/T 30544 "Nanotechnology Terminology": GB/T 30544 has issued the following parts:

--- Part 1: Core terms;

--- Part 3: Carbon nano-objects;

--- Part 4: Nanostructured materials;

--- Part 5: Nano/biological interface;

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

--- Part 7: Nanomedicine diagnosis and treatment;

--- Part 8: Nano-manufacturing process;

--- Part 12: Quantum phenomena in nanotechnology;

--- Part 13: Graphene and related two-dimensional materials: This document is equivalent to ISO /T S80004-12:2016 "Nanotechnology Terminology Part 12: Quantum Phenomena in Nanotechnology", The file type is adjusted from the ISO technical specification to the national standard of our country: This document adds a chapter "Normative References": Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents: This document was proposed by the Chinese Academy of Sciences: This document is under the jurisdiction of the National Nanotechnology Standardization Technical Committee (SAC/TC279): This document was drafted by: National Center for Nanoscience and Technology, Sun Yat-sen University, Beijing Pofilai Technology Co:, Ltd:, Beijing Academy of Science and Technology

Institute of Analysis and Testing (Beijing Physical and Chemical Analysis and Testing Center), University of Science and Technology Beijing, Zhongguancun Human Settlement Environment Engineering and Materials Research Institute: The main drafters of this document: Pu Lingyu, Sun Lianfeng, Zeng Hui, Chang Huaiqiu, Gu Chunpeng, Li Qinmei, Cao Wenbin, Gao Xia, Liu Huan, Liu Wenxiu, Huang Xinming:

The unique properties of nano-objects and the quantum effects produced by nanonization are important aspects of nanotechnology: As the scale of materials decreases to nano Due to the size limitation of particles in one-dimensional, two-dimensional or three-dimensional space, quantum effects (quantization of energy, amount of angular momentum childization, etc:): This leads to new size-formation-dependent properties and drives the emergence of new functionalities that are fully achievable with quantum forces: Learn to describe: my country has established a basic national standard system related to terminology in the field of nanotechnology: GB/T 30544 is proposed to be composed of 13 ministries points constitute:

--- Part 1: Core terms: The aim is to define basic terminology in the field of nanotechnology:

--- Part 2: Nano-objects: The purpose is to define the term nanoobjects:

--- Part 3: Carbon nano-objects: The purpose is to define the term carbon nanoobjects:

1 Scope

GB/T 30544.12-2023 is Part 12 of the Chinese nanotechnology vocabulary, and covers quantum phenomena. It is the part where the terminology has to be most careful, because the words - confinement, coherence, entanglement, tunnelling, superposition - have exact meanings in physics and loose ones in the literature that surrounds nanotechnology commercially, and a standard that is meant to support patents, procurement and regulation cannot leave the difference to context. The standard defines the terms of the general quantum concepts, of the fundamental quantum effects, of the quantum effects that arise from scale, of structural organisation, and of the quantum effects themselves. It took effect on 1 December 2023.

This document defines terms and definitions related to quantum phenomena in nanotechnology: This document applies to nanotechnology, where many terms also apply to some larger scale systems: This document does not cover the full spectrum of quantum concepts and phenomena in nanotechnology, but covers important concepts recognized by many stakeholders, including academia and industry: Phenomenon: This document is intended to facilitate communication between organizations and individuals in industry and those interested in it:

Note 1: See Appendix A for some terms in traditional physics and quantum physics:

Note 2: See Appendix B for the comparative relationship between nanotechnology terms

and practical applications and products:

2 Normative references

This document has no normative references:

3 Terms related to general quantum concepts

3:1 de Broglie wavelength deBroglie wavelength It is related to the volatility of any particle and can reflect the wave nature of the particle: It is a formula calculated according to the de Broglie formula:

Note: The de Broglie formula is lambda=h/p, where lambda is the wavelength, h is Planck's constant, and p is the momentum of the particle: 3:

2 Quantizationquantization The phenomenon of discontinuous change of physical quantity in microscopic system: 3:

3 Quantized quantized It has a discrete value and is a multiple of a basic quantity: NOTE: A fundamental quantity is often referred to as a single quantum of the physical quantity under study: 3:4 quantum coherence quantumcoherence Correlated evolution of the phase of the wave function in a system with quantum superposition (3:9): 3:5 quantum confinement When the particle is restricted to move in one-dimensional, two-dimensional or three-dimensional space, the size of the physical system and the particle's de Broglie wavelength (3:1) in the same order of magnitude: NOTE 1: The main characteristic lengths lead to quantum confinement, such as de Broglie wavelength, Fermi wavelength, mean free path, Bohr radius (exciton) or coherence length:

Note 2: See reference [3]: