

ICS 07.080
CCS A40



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 42441-2023

**Biomimetics - Biomimetic materials, structures and
components**

仿生学 仿生材料、结构和构件

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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 equivalent to ISO 18457:2016 "Bionics Bionic Materials, Structures and Components": 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 is proposed and managed by China Machinery Industry Federation: This document is drafted by: Beijing Machinery Industry Automation Research Institute Co., Ltd., Jilin University, Aoqing Medical Technology Co., Ltd: The main drafters of this document: Qin Xiugong, Zhang Zhihui, Zhang Baoyu, Zhang Qingquan, Jiang Yue, Yu Zhenglei, Yin Zuozhong, Gao Xueqin, Shao Yanlong, Wang Shupeng, Ren Luquan, Jiang Jiang, Sun Xun, Tang Cong, Du Jichao, Nie Zilin, Qiu Zhiye:

The constant complexity of technical solutions and products requires new approaches: Research and development methods and innovations in the traditional sense Approaches often have their limitations, especially in the development and optimization of materials, structures, and components: Properly identify the appropriate biological principles and should Transferring it to technical applications with biomimetic concepts can provide a basis for developing functional, adaptable, effective (in terms of resources) and safe Materials, structures, components and manufacturing processes (in terms of toxicity to humans and the environment) make an important contribution: Bionics Bionic materials, structures and components

1 Scope

GB/T 42441-2023 provides a framework for biomimetic development - engineering that takes its principles from biological systems. The field's difficulty is that it produces a great deal of striking work and rather little transferable method: the lotus leaf, the gecko foot and

the shark skin are cited endlessly, but moving from an observed biological function to a manufacturable material or component is where most projects fail, and each team reinvents the route. A standard here cannot prescribe results; what it can do is impose discipline on the process - separating the biological principle from the organism that exhibits it, stating the abstraction that carries the principle into engineering, and defining what has to be demonstrated for a claim of biomimetic function to be more than a description. This document provides a framework for developing biomimetic materials, biomimetic structures, biomimetic surfaces, biomimetic components and biomimetic manufacturing technologies, and sets out the principles of biological systems on which they draw. Under ICS 07.080 and CCS A40, it is written for research institutes and university groups, for the materials and manufacturing companies commercialising this work, and for the funding and evaluation bodies assessing it.

This document provides a framework for the development of biomimetic materials, biomimetic structures, biomimetic surfaces, biomimetic components, and biomimetic manufacturing technologies: This document elaborates the principles of biological systems, and in particular the properties of biological prototype materials, structures, surfaces, components, and The biomimetic approach provides motivation and reason for the fabrication of technology: At the same time, this document specifies the analogy, extraction and method: The transition from biology to technology is described based on several examples of biomimetic materials, structures, surfaces, components, and fabrication techniques: This article This document describes the measurement methods and parameters that can reflect the properties of bionic materials, and provides information on bionic materials, structures, surfaces, components, and engineering: Related manufacturing technologies provide information support: This document also addresses the subfield of biomimicry arising from the fundamental development of materials, structures, surfaces, components, and the associated Broader innovations in manufacturing technology: This document is for all development, design, preparation or application of bionic materials, structures, surfaces, components and their manufacturing Technical staff provided guidance and support:

2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text: Among them, dated references For documents, only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to this document:

GB/T 42444-2023 Bionics terms, concepts and methodology (ISO 18458:2015, IDT)

3 Terms and Definitions

The following terms and definitions defined in GB/T 42444-2023 apply to this document: 3:

1 Adaptability Ability to adapt to different environmental conditions: 3:2 efficiency The relationship between useful outputs of the system and all inputs: 3:

3 The manufacturing process of three-dimensional components, such as layer-by-layer forming of materials: NOTE: These techniques are available in four different manufacturing grades:

---Concept model (additive manufacturing): Mechanical loads cannot be applied to these models, and these models can only provide a three-dimensional vision;

---Functional models (additive manufacturing): these models have similar properties to the components that are later used in mass production;

---Tools (rapid tooling manufacturing): molds manufactured in combination with other manufacturing processes;

---Small batch production (rapid manufacturing): corresponding to the three-dimensional model forming of necessary and practical attributes: 3: