

## Translation



*This is a translation of China's catalog of prohibited and restricted exports, as updated in July 2025. This catalog, along with China's two dual-use export control lists, is one of three major documents that list China's export-controlled items and technologies. The catalog of prohibited and restricted exports has two parts: technologies that may not be exported from China under any circumstances, and a much longer list of technologies whose export is subject to unspecified "restrictions." The catalog does not mention how the export eligibility review process works for this latter category; this process is the subject of other Chinese laws and regulations. The July 2025 revision adds several technologies related to lithium-ion battery manufacturing to the catalog, demonstrating China's confidence that it is the world leader in these technologies.*

### Title

Chinese Catalogue of Technologies Prohibited or Restricted from Export [July 2025]  
中国禁止出口限制出口技术目录

### Author

Chinese Ministry of Commerce (MOFCOM; 商务部) and Ministry of Science and Technology (MOST; 科学技术部; 科技部)

### Source

MOST website, July 15, 2025.

*This translation incorporates China's July 2025 list of modifications to the Catalogue into the full text of the Catalogue as published by China in December 2023.*

*The Chinese text of the July 2025 modifications is available online at:*

<https://www.most.gov.cn/satp/kjzc/zh/202507/W020250715667217958887.pdf>

*The Chinese full text of the December 2023 Catalogue is available online at:*

<https://www.most.gov.cn/tztg/202312/W020231221620858841394.pdf>

*Archived versions of the Chinese text of the July 2025 modifications and the December 2023 full text are available online at <https://perma.cc/KT3B-XQY3> and <https://perma.cc/B5Z7-JH2T> respectively.*

### Translation Date

August 18, 2025

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## Chinese Catalogue of Technologies Prohibited or Restricted from Export [July 2025]<sup>1</sup>

<sup>1</sup> Translator's note: The July 2025 changes to the *Chinese Catalogue of Technologies Prohibited or Restricted from Export* are as follows:

**Ministry of Commerce (MOFCOM)**  
**Ministry of Science and Technology (MOST)**

**Reference Principles for Chinese Technologies Prohibited or Restricted  
from Export**

**I. Reference Principles for Technologies Prohibited from Export**

- (i) Where export is prohibited to safeguard national security, the public interest, or public morality;
- (ii) Where it is necessary to prohibit export to protect human health or safety, protect animal or plant life or health, or protect the environment;
- (iii) Other cases where it is necessary to prohibit export in accordance with laws and administrative regulations;
- (iv) Other cases where it is necessary to prohibit export pursuant to the provisions of international treaties and agreements concluded by China or to which it is a party.

**II. Reference Principles for Technologies Restricted from Export**

- (i) Where it is necessary to restrict export to safeguard national security, the public interest, or public morality;

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In the “Prohibited from Export” portion:

- (1) item 085001J “Chinese traditional building technology” is deleted.

In the “Restricted from Export” portion:

- (2) items 085001X “Chinese traditional building technology” and 085001X “Building environmental control technology” are deleted.
- (3) Item 252604X “Technology for battery positive electrode materials and preparations” (pp. 21-22) is added.
- (4) In item 083201X “Non-ferrous metals metallurgy technology,” control point 2 is changed from “‘Dissolution method’ ( “溶解法” ) process of recovering gallium in the original liquid using the precipitation mother liquor (种分母液) in alumina production” to “Technology and techniques for extracting metallic gallium from alumina mother liquor (母液) using methods such as ion exchange and ion exchange resin” (p. 27).
- (5) In item 083201X, control points 9-13, all related to lithium extraction, are added (pp. 28-29).

CSET’s English translation of the previous (December 2023) version of the *Chinese Catalogue of Technologies Prohibited or Restricted from Export* is available online at:

<https://cset.georgetown.edu/publication/china-export-control-catalog-2023/>.

- (ii) Where it is necessary to restrict export to protect human health or safety, protect animal or plant life or health, or protect the environment;
- (iii) Other cases where it is necessary to restrict export in accordance with laws and administrative regulations;
- (iv) Other cases where it is necessary to restrict export pursuant to the provisions of international treaties and agreements concluded by China or to which it is a party.

## Description of Catalogue Format

### Catalogue Format

Number: <sup>(1)</sup> X X X X X J(X)

Technology name: <sup>(2)</sup> \_\_\_\_\_

Control points: <sup>(3)</sup> \_\_\_\_\_

### Notes:

- (1) Number: 7 digits in total

XX	XX	XX	J(X)
year code	industrial classification code	sequence no.	prohibited (restricted) code

- 1) The year code consists of the last two digits of the year of the announcement of the technology's inclusion in this catalogue
- 2) The industrial classification code is the technology's classification number from the *Industrial Classification for National Economic Activities*
- 3) The sequence number is a code representing the order that technology is listed in within the same industrial classification
- 4) "J" represents technologies prohibited from export, and "X" represents technologies restricted from export<sup>2</sup>

- (2) Technology name: The general name of a certain type of technology.

- (3) Control points: The technical content, characteristics, and scope of the type of

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<sup>2</sup> Translator's note: Hanyu Pinyin (汉语拼音), or Pinyin (拼音; "spelling according to sound") for short, is the official method of Romanization—that is, the use of Roman letters to represent the pronunciation of Chinese characters—in the People's Republic of China (PRC). The Pinyin for the Chinese phrase "technologies prohibited from export" (禁止出口技术) is jìnzhǐ chūkǒu jìshù, which begins with the letter "J." The Pinyin for the Chinese phrase "technologies restricted from export" (限制出口技术) is xiànzhì chūkǒu jìshù, which begins with the letter "X."

technology to be controlled.

- (4) This catalogue is edited and sorted with reference to the *Industrial Classification for National Economic Activities* (国民经济行业分类) and their corresponding codes (GB/T 4754-2017).<sup>3</sup>

## ***Chinese Catalogue of Technologies Prohibited or Restricted from Export***

### **Prohibited from Export Portion**

#### **Animal Husbandry<sup>4</sup>**

##### **1. 080301J**

Technology name: Breeding technology of livestock breeds

Control point: Breeding technologies for breeds classified as “Class 1” in the National Livestock and Poultry Breed Export Management Classification List (《国家畜禽品种出口管理分级名录》)

##### **2. 080302J**

Technology name: Silkworm varieties and breeding, and cocoon collection, processing, and utilization technologies

Control points:

1. Silkworm genetic resources, except first-generation hybrid silkworm varieties
2. Utilization technology of silkworms and closely related silk insects such as *Antheraea pernyi*, *Samia ricini*, and *Antheraea yamamai*

#### **Fishery**

##### **3. 080401J**

Technology name: Breeding technology of aquatic germplasm

Control point: Germplasm breeding technologies listed in *List of Aquatic Germplasm Resources in China Not to Be Exchanged at the Current Stage* (《我国现阶段不对外交

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<sup>3</sup> Translator's note: China's *Industrial Classification for National Economic Activities* (国民经济行业分类) assigns a two-digit code to each of 97 defined industries. The *Industrial Classification for National Economic Activities* is available online (in Chinese) at: <https://perma.cc/7T8C-Z3BD>.

<sup>4</sup> Translator's note: From this point on, the Chinese version of this document was published as a table. For reasons of readability, this English translation is in outline format.

换的水产种质资源名录》)

## **Paper Manufacturing and Paper Products**

### **4. 082201J**

Technology name: Paper manufacturing technology

Control points:

1. Xuan paper<sup>5</sup> production technology
2. Qian'an (迁安) mulberry bark painting and calligraphy paper formulation and production technology

## **Handicraft and Other Manufacturing**

### **5. 082401J**

Technology name: Manufacturing technology of painting and calligraphy ink and babao ink pads (八宝印泥)

Control points:

1. Calligraphy ink formulations
2. Babao ink pad formulations

## **Chemical Raw Materials and Chemical Products Manufacturing**

### **6. 082601J**

Technology name: Fireworks (焰火) and firecrackers (爆竹) production technology

Control point: Fireworks (鞭炮) and firecrackers (烟花) production technology

1. Shell filling processes of ignition and detonation devices
2. Filler formulations and adhesives
3. Mechanical shaping processes of spherical shells (球壳)
4. Formulations and production processes of multicolored pellet flash pyrotechnic agents (多色彩药粒闪光炮药物)
5. Alloy powder formulations and production processes

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<sup>5</sup> Translator's note: Xuan paper (宣纸) is a soft and fine-textured type of paper with a history in China going back centuries. It is particularly suitable for Chinese calligraphy and painting.

6. Smokeless fireworks (无烟礼花) formulations and production processes

### Pharmaceutical Manufacturing

#### 7. 082701J

Technology name: Chinese herbal medicine material resources and production technology

Control points:

1. Wild Chinese herbal medicine material resources that are among the world's rare and endangered protected plants and animals, and their breeding technologies
2. Formulations and production techniques of substitutes for endangered and rare medicinal herbs
3. Purification, cultivation, fermentation, and production processes of fungal medicinal herb species and strains including the following species and strains:

*Ophiocordyceps sinensis* (caterpillar fungus)

*Morchella esculenta* (morel mushrooms)

*Fistulina hepatica* (beefsteak fungus)

*Trametes versicolor* (turkey tail)

*Ganoderma applanatum* (artist's bracket)

*Ganoderma lucidum* (or *Ganoderma sinense*)

*Omphalia lapidescens*

*Polyporus umbellatus* (umbrella polypore)

*Armillaria mellea* (honey mushroom)

*Tricholoma matsutake* (matsutake mushroom)

*Phallus duplicatus* (netted stinkhorn)

*Phallus indusiatus* (basket stinkhorn)

*Phallus multicolor*

*Calvatia gigantea* (giant puffball)

*Xylaria nigripes*

*Wolfiporia extensa*

## 8. 082702J

Technology name: Chinese herbal medicine flake processing technology

Control points:

1. Processing techniques and production area processing technology of toxic traditional Chinese medicines
  - (1) Preparation of taproot of *Aconitum carmichaelii* (川乌)
  - (2) Preparation of root of *Aconitum kusnezoffii* (草乌)
  - (3) Preparation of *Arisaema heterophyllum* and *Arisaema heterophyllum* chunks<sup>6</sup>
  - (4) Preparation of dried *Sauromatum giganteum* tubers (白附子)
  - (5) Pinelliae Rhizoma Praeparatum Cum Alumine (清半夏), Pinelliae Rhizoma Praeparatum (法半夏), Pinelliae Rhizoma Praeparatum Cum Zingibere et Alumine (姜半夏)
  - (6) Preparation of dried *Aconitum coreanum* tubers (关白附)
  - (7) Preparation of lateral root of *Aconitum carmichaelii* (附子)
  - (8) *Phytolacca acinosa* preparation
  - (9) *Strychnos nux-vomica* preparation
  - (10) Wheat bran-stewed nutmeg kernel (煨肉豆蔻)
  - (11) *Daphne genkwa* preparation
  - (12) Dried bufotalin (蟾酥) preparation
  - (13) *Garcinia hanburyi* gum resin (藤黄) preparation
  - (14) Radix Kansui (甘遂) preparation
  - (15) *Stellera chamaejasme* preparation
  - (16) *Croton tiglium* powder (巴豆霜)
  - (17) Dried blister beetle<sup>7</sup> preparation

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<sup>6</sup> Translator's note: *Arisaema heterophyllum* chunks (胆南星) are used in traditional Chinese medicine (TCM) to treat coughs, epilepsy, and other ailments. They are made from powdered *Arisaema heterophyllum* (dancing crane cobra lily; 天南星) combined with ox, sheep, or pig bile and dried into chunks.

<sup>7</sup> Translator's note: Dried blister beetle (斑蝥) is used in traditional Chinese medicine to treat a variety of ailments. It is made from the dried bodies of two species of blister beetle, *Hycleus phaleratus* and *Mylabris variabilis*.

- (18) Dried *Lytta caraganae* (青娘子) preparation
  - (19) Realgar powder (飞雄黄)
  - (20) Cinnabar powder (飞朱砂)
  - (21) *Euphorbia pekinensis* Rupr.<sup>8</sup> preparation
  - (22) *Euphorbia lathyris* powder (千金子霜)
2. Processing techniques and production area processing technology of commonly used bulk Chinese herbal medicines
- (1) Processed rhubarb (熟大黄)
  - (2) Processed *Rehmannia glutinosa* rhizome (熟地黄)
  - (3) *Reynoutria multiflora* preparation
  - (4) *Cyperus rotundus* preparation
  - (5) Deer antler
  - (6) Dried human placenta
  - (7) Massa Medicata Fermentata<sup>9</sup>
  - (8) Fujian Massa Medicata Fermentata<sup>10</sup>
  - (9) Pangolin scales
  - (10) Cistanche (肉苁蓉) preparation
  - (11) *Polygonatum sibiricum* preparation
  - (12) *Cornus officinalis* preparation
  - (13) *Ligustrum lucidum* seed (女贞子) preparation
  - (14) Red ginseng (红参)
  - (15) Magnolia bark (厚朴)

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<sup>8</sup> Translator's note: The Chinese text here reads "golden *Euphorbia pekinensis*" (金大戟). The translator believes that the first character 金, pronounced *jīn*, is a typo for the similar-sounding character 京 *jīng*, making "*Euphorbia pekinensis* Rupr." (京大戟).

<sup>9</sup> Translator's note: Massa Medicata Fermentata (六神曲) is used in traditional Chinese medicine to treat maladies of the stomach and spleen. It is composed of powdered *Persicaria hydropiper*, *Artemisia annua*, *Xanthium sibiricum* (or *Xanthium strumarium*), *Vigna umbellata*, bitter almonds, wheat bran, and wheat flour, mixed together and baked into bricks.

<sup>10</sup> Translator's note: Fujian Massa Medicata Fermentata (建神曲) is used in traditional Chinese medicine to treat stomach aches, indigestion, dysentery, colds, and headaches. It is composed of powdered wheat flour, wheat bran, and other ingredients mixed together and baked into leavened bricks.

- (16) Donkey-hide gelatin
- (17) Dragon's blood (龙血竭)

9. 082703J

Technology name: Extraction and processing technology of medicinal-use ingredients from China's scarce and endangered plants

Control point: Paclitaxel and related technologies

### **Nonmetallic Mineral Products**

10. 083001J

Technology name: Amorphous inorganic nonmetallic materials production technology

Control point: High-power, large-size neodymium glass preparation technology for laser technology

11. 083002J

Technology name: Low-dimensional inorganic nonmetallic materials production technology

Control point: Production technology of rigid, low-density, bonded (粘结) carbon fibers or non-fibrous carbon insulation (绝热) materials having one of the following characteristics

1. Can be used at temperatures above 2273 K (2000 °C).
2. Density between 100 and 300 kg/m<sup>3</sup>
3. Compression strength between 0.1 and 1.0 MPa
4. Flexural strength  $\geq 1.0$  MPa
5. Carbon content over 99.9% of total solids

### **Non-Ferrous Metals Smelting and Rolling Processing**

12. 083201J

Technology name: Rare earths refining, processing, and utilization technology

Control points:

1. Processes and technology of liquid-liquid extraction and separation of rare earths
2. Production technology of rare earth metal and alloy materials

3. Preparation technology of samarium cobalt, neodymium, and cerium magnets
4. Preparation technology of rare earth calcium oxide boric acid (硼酸氧钙)

### **Railroad, Shipping, Aviation, Spaceflight, and Other Transportation Equipment Manufacturing**

#### 13. 083701J

Technology name: Spacecraft tracking and control technology

Control point: Encoding and encryption technology for radio remote control and telemetry of satellites used by China and their launch vehicles, including algorithms, code tables (码表), etc.

#### 14. 083702J

Technology name: Aircraft design and manufacturing technology

Control point: Design technology and manufacturing technology of core engines in aviation gas turbines

### **Computers, Communications, and Other Electronic Equipment Manufacturing**

#### 15. 083901J

Technology name: Integrated circuit manufacturing technology

Control point: Radiation hardening technologies and processes

(1) Manufacturing technology of devices with anti-static  $\geq 2,500$  V, transient dose rate hardening (抗瞬时剂量率)  $> 1 \times 10^{11}$  rad (Si)-s silicon on sapphire/complementary metal-oxide-semiconductor (SOS/CMOS)

(2) Manufacturing technology of bipolar devices with anti-static  $\geq 3,000$  V and transient dose rate hardening  $> 1 \times 10^{11}$  rad(Si)-s

#### 16. 083902J

Technology name: Robot manufacturing technology

Control point: Manufacturing technology of remote-controlled nuclear and chemical reconnaissance robots

### **Telecommunications, Radio, Television, and Satellite Transmission Services**

#### 17. 086301J

Technology name: Computer network technology

Control points: Information security and secrecy protection (保密) technologies used by China's governmental, financial, industrial, and scientific research sectors and involving state secrets, including information concealment (信息隐蔽) technology, security threat detection technology, etc.

18. 086302J

Technology name: Space data transmission technology

Control point: Secrecy protection technologies for satellite control of information transmission involving one of the following

1. Secrecy protection principles, plans, and circuit design technology
2. Encryption and decryption software and hardware

19. 086303J

Technology name: Satellite applied technologies

Control point: Information transmission encryption technology of the BeiDou Satellite Navigation System, including related software

### **Research and Experimental Development**

20. 237301J

Technology name: Technology used in human cell cloning and gene editing

Control point: Gene editing technology used to edit human germ cells containing hereditary matter (namely, embryonic cells, ova, and spermatozoa) that is ethically controversial and can produce great harm

### **Professional Technical Services**

21. 087401J

Technology name: Geodetic measurement technology

Control points:

1. Satellite positioning technology that directly outputs China's geodetic coordinates
2. China's geodetic, satellite, gravity, and elevation databases and their development and application technologies
3. China's models of earth's gravity field

22. 087402J

Technology name: Cartographic technology

Control point: Direct-output image products with topographic elements of China with scale  $\geq 1:100,000$

### **Health**

23. 088401J

Technology name: Medical technology of traditional Chinese medicine

Control point: Key acupoints of acupuncture anesthesia (真麻) for cranial surgery

## Restricted from Export Portion

### Agriculture

#### 1. 080101X

Technology name: Crop (including forage) germplasm resources and breeding technology

Control points:

1. Two-line and three-line hybrid (两系、三系杂交) vigor-utilizing (优势利用) seed production technology for grain, cotton, and oil crops
2. Dominant nuclear sterile (显性核不育) three-line seed production technology for rapeseed
3. Selection and application technology of self-incompatible lines and male-sterile lines in vegetables
4. Corn anther growth medium preparation process
5. Cultivated seed production and multiplication technology of fat choy (*Nostoc flagelliforme*)
6. Germplasm resources and breeding technology of crops (including forage) supplied to foreign countries (对外提供) that are listed in the Crop Germplasm Resources Classification List (农作物种质资源分类名录)

#### 2. 080102X

Technology name: Cultivation and breeding technology of cash crops

Control points:

1. Technology for creation and genetic analysis and identification of important core germplasm resources and breeding stock for tobacco
  - (1) Germplasm resources that have been identified as belonging to important antigens, including tobacco germplasm resources that have immunity or high resistance to major plant diseases and insect pests such as viral diseases, black shank, bacterial wilt, rust disease (赤星病), powdery mildew, tobacco aphids, *Helicoverpa assulta*, and *Meloidogyne incognita*
  - (2) Specific (特异性) tobacco germplasm resources, including main cultivars of leafier, extra-fragrant, special-fragrance, high-potassium,

high-sugar, high-protein, or white-flower<sup>11</sup> forms, and main cultivars of sun-cured tobacco with physiological genetic markers, excellent quality, or from renowned local or regional producers

- (3) High-nicotine germplasm resources with nicotine content of 6% or higher
- (4) Breeding materials and germplasm resources of male-sterile two-line matched pairs (雄性不育二系配套) of an internationally advanced level, and germplasm resources for special breeding (特殊育种) uses
- (5) Scarce and rare local germplasm resources collected or discovered in China

## 2. Tobacco medium pollen (介质花粉) technology

### 3. 200103X

Technology name: Artificial breeding technology of agricultural wild plants

Control points:

1. Artificial breeding technology for wild plants overseen by agricultural departments that are listed as Class I in the *List of Wild Plants under State Priority Conservation*
2. Artificial breeding technology for agricultural wild plants listed in the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES)

### 4. 200104X

Technology name: Genetic engineering (genes and vectors)

Control points:

1. Newly discovered plant male sterility genes, fertility restorer genes, and vectors
2. Newly discovered disease and insect resistance genes and vectors
3. Newly discovered stress resistance genes and vectors
4. Newly discovered qualitative genes and vectors

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<sup>11</sup> Translator's note: "White-flower tobacco" (百花烟草) can refer to either *Nicotiana repanda* or *Nicotiana alata*, two species of tobacco that often have white flowers.

5. Newly discovered yield-related genes and vectors
6. Other important newly discovered genes and vectors
7. Unique genetic manipulation (基因操作) technology

5. 230105X

Technology name: Technologies for the utilization of agricultural crop hybrids that China is well-endowed (优势) with

Control points:

1. Resources of endangered, scarce, and important species found in China, such as individuals, organs, tissues, cells, or genes of these species usable in propagation through regeneration (再生传代), or seeds or genetic information of these species usable in propagation through breeding (繁殖传代)
2. Hybrid breeding technology of endangered, scarce, and important species found in China

**Forestry**

6. 080201X

Technology name: Forest tree germplasm resources and their breeding technologies

Control points:

1. Wild plants listed as Class I in the List of Wild Plants under State Priority Conservation and overseen by forest and grassland departments (林草部门), and their artificial breeding (人工繁育) technology
2. Poplar triploids and their breeding technology
3. Wild plants listed in the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and their artificial breeding technology

7. 080202X

Technology name: Breeding technology of garden plants and ornamental plants

Control point: Artificial breeding technology of ornamental plants listed in the List of Wild Plants under State Priority Conservation

8. 080203X

Technology name: Wild animal artificial breeding and conservation technology

Control points:

1. Artificial breeding technology for terrestrial animals classified as Class III in the List of Wild Animals under State Priority Conservation, as well as key feeding methods and feed formulas and additives for young offspring and chicks until they are six months old
2. Formulas and processing technology of feed for the crested ibis, red-crowned crane, and green peafowl, and other rare birds
3. Artificial breeding technology of giant pandas and other rare mammals

### **Animal Husbandry**

#### **9. 080301X**

Technology name: Breeding technology of livestock breeds

Control points:

1. Breeding technologies for breeds categorized as “Class 2” in the National Categorized Export Management List for Livestock and Poultry Breeds (《国家畜禽品种出口管理分级名录》)
2. Baise horse (白色矮马) breeding technology
3. Bama Xiang pig (Huanjiang Xiang pig) breeding technology
4. Beijing fatty chicken (北京油鸡) breeding technology

#### **10. 200302X**

Technology name: Cashmere goat breeding technology

Control point: Crossbreeding, artificial insemination, and embryo and gene cloning and breeding technologies

#### **11. 200303X**

Technology name: Breeding technology of cashmere goat breeds

Control point: Maternal, paternal, and hybrid breeding stock of new and improved breeds of Inner Mongolia cashmere goats, Ujimqin (Wuzhumuqin) white cashmere goats, Hanshan white cashmere goats, Liaoning cashmere goats, Jinlan cashmere goats, Hexi cashmere goats, and Tibetan cashmere goats

### **Fishery**

## 12. 080401X

Technology name: Breeding technology of aquatic germplasm

Control points:

1. Germplasm breeding technologies listed in the List of Aquatic Germplasm Resources in China that Conditionally Can Be Exchanged at the Current Stage (《我国现阶段有条件对外交换的水产种质资源名录》)
2. Cultivation and production process of freshwater microalgae
  - (1) Algae purification and *Pleodorina* (杂藻) suppression and control technology
  - (2) Algae cultivation processes and concentration technology
  - (3) Related monitoring techniques
  - (4) Measurement and control technology for bodies of water and water quality used for cultivation
3. Artificial breeding technology of so-iuy mullet (*Planiliza haematocheilus*; 梭鱼)
  - (1) Freshwater cultivation of broodstock, and drug-induced artificial breeding technology
4. Artificial nursery and feed cultivation technology for *Siniperca chuatsi*
  - (1) Artificial spawning and nursery technology for *Siniperca chuatsi*
  - (2) Aquafeed and synchronized cultivation technology for juvenile fish
5. River crab artificial breeding technology
  - (1) Spawning technology, facilities, and processes
  - (2) Larvae (幼体) cultivation and aquafeed
  - (3) Disease prevention and control
  - (4) Parent (亲体) river crab cultivation
6. Artificial nursery technology for grouper
  - (1) Broodstock cultivation
  - (2) Maturation, spawning techniques, drugs
  - (3) Fry cultivation, diet switching, transitional fish meal
7. Artificial nursery technology for *Bostrychus sinensis*

- (1) Juvenile cultivation technology and processes
- (2) Broodstock cultivation, spawning technology, and processes
8. Artificial breeding technology of Hepu mitten crab (*Eriocheir hepuensis*)

### **Agricultural, Forestry, Animal Husbandry, and Fishery Services**

#### 13. 080501X

Technology name: Veterinary medicine production technology

Control points:

1. Equine infectious anemia (EIA) attenuated virus strains
2. Mycoplasmal pneumonia of swine (MPS) attenuated virus strains
3. Contagious bovine pleuropneumonia (CBPP) attenuated virus strains
4. Attenuated rinderpest (RP) vaccine strains
5. Tropical theileriosis (牛环形泰勒焦虫病) cell-based vaccine species (细胞苗种)
6. Classical swine fever (CSF) live vaccine strains
7. Highly pathogenic avian influenza (HPAI) virus strains
8. Foot-and-mouth disease (FMD) virus strains
9. African swine fever virus (ASFV) strains

#### 14. 080502X

Technology name: Veterinary health and quarantine technology

Control points:

1. CSF strong and weak virus antibody testing technology
  - (1) Monoclonal antibody and hybridoma cell strains
2. EIA strong and weak virus antibody testing technology
  - (1) Monoclonal antibody and hybridoma cell strains

### **Non-Ferrous Metal Mining and Processing**

#### 15. 080901X

Technology name: Mining engineering technology

Control point: Ionic rare earth mine leaching processes

### **Agricultural and Non-Staple Food Processing**

16. 081301X

Technology name: Sugar processing technology

Control point: Stuffed monocrystal rock sugar (夹心单晶冰糖) production process

### **Textiles**

17. 081701X

Technology name: Langxiang silk (苎香绸) processing technology

Control point: Langxiang silk processing techniques

18. 081702X

Technology name: Textile fiber products and their processing technology

Control points:

1. Indigo dyeing processes using unique traditional formulas
  - (1) Indigo dyeing process for handwoven fabrics
2. Traditional hand tie-dyeing craft technology
  - (1) Traditional hand tie-dyeing craft technology
3. Silk fabric product batik processes
  - (1) Silk fabric batik processes
4. Silk shrinkage prevention and wrinkle resistance processing technology
  - (1) Silk shrinkage prevention and wrinkle resistance processing techniques
  - (2) Silk shrinkage resistance and wrinkle resistance additive formulas

### **Paper Manufacturing and Paper Products**

19. 082201X

Technology name: Traditional handmade paper production technology

Control point: Production technology of bamboo paper, mulberry paper (桑皮纸), paper mulberry paper (构皮纸), and other traditional handmade paper

## **Cultural, Educational, Industrial Arts, Sports, and Entertainment Products Manufacturing**

20. 082401X

Technology name: Handicraft manufacturing technology

Control points:

1. Metal handicraft production technology and processes
  - (1) Variegated copperware surface treatment process
2. Manufacturing technology and processes of lacquerware handicrafts
  - (1) Raw material processing and production technology of mother-of-pearl inlaid lacquerware
3. Embroidery production technology and processes
  - (1) Double-sided "three different" embroidery,<sup>12</sup> "three different" kesi<sup>13</sup> weaving craft, and small-needle picking (摘小针) processing method
  - (2) The technical know-how of Ming Dynasty dragon robes with four coiled dragons woven with gold thread (四团龙织金纱龙袍), satin brocade (花缎) dragon robes, and Zhuang Hua<sup>14</sup> woven with peacock feather and gold
4. Production technology and techniques of other handicrafts
  - (1) Inner painting technique of snuff bottles and other handicrafts

## **Chemical Raw Materials and Chemical Products Manufacturing**

21. 082601X

Technology name: Biological pesticide production technology

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<sup>12</sup> Translator's note: Double-sided "three different" embroidery (双面三异绣) is historically associated with the city of Suzhou in China's Jiangsu Province. This style of embroidery is used for decorative screens, panels, and furniture. "Three different" refers to the fact that there are different patterns, different needlework, and different colors on either side of the fabric.

<sup>13</sup> Translator's note: "Three different" kesi (三异缂丝) refers to one type of kesi (缂丝), a traditional Chinese technique of weaving silk into pictorial tapestries. "Three different" refers to a style of double-sided kesi in which there are different patterns, different needlework, and different colors on either side of the fabric.

<sup>14</sup> Translator's note: Zhuang Hua (妆花) is a type of Jacquard fabric woven with colorful silk threads. Its production was historically associated with the city of Nanjing in China's Jiangsu Province.

Control points:

1. Production process of microsporidia preparations for locust extermination
2. Production process of polyhedrosis virus (多角体病毒) strains and preparations
3. Jिंगgangmycin (validamycin; 井岗霉素) strains and production technology
4. Huaguangmycin (nikkomycin; 华光霉素) strains and production technology
5. Lividomycin (liuyangmycin; 浏阳霉素) strains and production technology
6. Chlortetracycline (aureomycin) strains and production technology
7. Ningnanmycin strains and production technology
8. Avermectin strains and production technology
9. Bt strains and production technology
10. *Bacillus subtilis* strains and production technology
11. Kasugamycin strains and production technology
12. Pyrimidine nucleoside antibiotics (nong-kang 120 [农抗 120]) strains and production technology
13. *Beauveria bassiana* and *Metarhizium* strains and species and production technology
14. Spinosad strains and production technology

22. 082602X

Technology name: Paint production technology

Control point: Multicolor, multi-wavelength laser stealth (激光隐身) paint formulas and production technology

23. 082603X

Technology name: Synthetic fiber production technology

Control points: Carbon fiber processing technology

24. 252604X

Technology name: Technology for battery positive electrode materials and preparations

Control points:

1. Lithium iron phosphate battery preparation technology that meets both of the following conditions:
  - (1) Chemical general formula  $\text{Li}_x\text{Fe}_y\text{M}_z\text{PO}_4$ , where  $x, y, z \geq 0$  and M is one or more elements other than Li and Fe
  - (2) This material is a powder with compacted density  $\geq 2.58$  g/cc under 220 MPa, discharge capacity per gram  $\geq 160$  mAh/g, and initial coulombic efficiency  $\geq 97\%$
2. Lithium manganese iron phosphate battery preparation technology that meets both of the following conditions:
  - (1) Chemical general formula  $\text{Li}_x\text{Fe}_y\text{Mn}_z\text{M}_a\text{PO}_4$ , where  $x, y, z, a \geq 0$  and M is one or more elements other than Li, Fe, and Mn
  - (2) This material is a powder with compacted density  $\geq 2.38$  g/cc under 220 MPa, initial coulombic efficiency  $\geq 95\%$ , 0.1C discharge capacity per gram  $\geq 155$  mAh/g, and 0.1C average voltage  $\geq 3.85\text{V}$
3. Phosphate positive electrode raw material preparation technology
  - (1) Preparation techniques for iron phosphate, manganese iron phosphate, ferrous oxalate for batteries, lithium (di)hydrogen phosphate (磷酸二(一)氢锂) for batteries, and lithium phosphate for batteries, the iron phosphate of which meets both of the following conditions: tap density  $> 1.2$  g/cc, magnetic foreign matter  $< 10$  ppb

### Pharmaceutical Manufacturing

25. 082701X

Technology name: Chinese herbal medicine material resources and production technology

Control points:

1. *Cordyceps militaris* manual cultivation technology
2. *In vivo* musk extraction and breeding technology of farmed musk deer (dwarf musk deer, alpine musk deer)
3. Kernel implanting (埋核) technology for cultivation of cattle gallstones in the bodies of cattle
4. Formulations and technology of artificial cattle gallstones, artificial tiger bone, artificial musk deer musk, and other varieties

5. Plant seeds (including seed-type ingredients in unprocessed herbal medicine [生药]), seedlings, and animal germplasm resources of bulk varieties of herbal medicine materials included in the *Pharmacopeia of the People's Republic of China* (《中华人民共和国药典》), and their breeding technology
6. Germplasm and genetic resources of China's herbal medicine materials listed in the *List of Wild Plants under State Priority Conservation* and the *List of Wild Animals under State Priority Conservation*, and their artificial breeding technology

## 26. 082702X

Technology name: Production technology of biotechnology-based drugs

Control points:

1. Microbial strains and viral strains obtained through separation and screening and having industrialized production potential, as well as their selection and breeding technologies
  - (1) Viral strains (including wild mouse and house mouse types) for inactivated epidemic hemorrhagic fever vaccine production
  - (2) Inactivated enterovirus 71 (EV71) vaccine
2. Attenuated microbial strains and viral strains for live vaccine production, and their selection and breeding technologies
  - (1) Viral strains for live-attenuated hepatitis A vaccine production
  - (2) Viral strains for live-attenuated Japanese encephalitis vaccine production
  - (3) Viral strains for live-attenuated chickenpox vaccine production
3. Biohazardous microbial species and viral strains, whether wild or obtained by genetic engineering methods, and their selection and breeding technologies
4. Viral strains for oral rotavirus production

## 27. 082703X

Technology name: Chinese herbal medicine formulation and production technology

Control point: Technology for reducing the heavy metals in *Dendrobium nobile* balls (石斛夜光丸) to below the limit standard

## 28. 082704X

Technology name: Preparation and processing technology of tissue engineering medical device products

Control points:

1. Tissue cell isolation (细胞分离) and culturing technology
2. Tissue cell growth media formulation technology
3. Processing technology of material scaffolds (材料支架)
4. Culturing and processing technology of tissue engineering products
5. Preservation technology of tissue engineering products

### **Rubber Products**

29. 082901X

Technology name: Rubber products production technology

Control points:

- 1 Aircraft tire manufacturing technology
2. Rubber load-carrying tire manufacturing technology (with a load-bearing capacity of more than 20 tons per single tire)

### **Nonmetallic Mineral Products**

30. 083001X

Technology name: Inorganic nonmetallic materials production technology

Control points:

1. Preparation technology of asbestos-free nonmetallic fiber-reinforced antiwear (抗磨) materials
  - (1) Formulation and processing technology of asbestos-free nonmetallic fiber-reinforced materials
  - (2) Antiwear additive (抗磨剂) production technology
2. Continuous silicon carbide (SiC) fiber production technology
  - (1) Polycarbosilane molecular weight and molar mass distribution control technology
  - (2) Continuous spinning technology for organosilicon polymers
  - (3) Two-step non-melting processing technology

- (4) Pyrolysis process of synthesizing polycarbosilane
3. Carbon fiber product processing technology with the following characteristics
  - (1) Fine-weave pierced fabric (FWPF) technology
  - (2) Triaxial conical fabric (三向锥体织物) technology
4. Preparation technology of moisture-proof coatings for boron nitride (BN) fiber
5. Technology for preparing zirconia fiber insulation material
6. Technology for preparing SiC fiber by the chemical vapor deposition (CVD) method

### 31. 083002X

Technology name: Artificial crystal growth and processing technology

Control points:

1. Tellurium dioxide ( $\text{TeO}_2$ ) and aluminum molybdate ( $\text{Al}_2\text{MoO}_4$ )<sub>3</sub> single crystal growth process and substrate finishing technology
2. Production method for ultra-long (> 250 mm) lithium niobate wafers
  - (1) Technology for growing lithium niobate crystals with length > 280 mm and diameter > 40 mm
  - (2) Finishing technology for lithium niobate single-crystal wafers with length > 250 mm
3. Processes for growing, and wafer processing technology for, bismuth silicon oxide (BSO) and bismuth germanium oxide (BGO) single crystals with length > 180 mm
4. Preparation process of 75-3 water-soluble dry film photoresist masks (水溶性光致抗蚀掩孔干膜)
5. Processes for growing tungsten-bronze photorefractive single crystals for manufacturing self-pumped phase-conjugate mirrors (SPPCM)
6. Raw material treatment technology and growth process for potassium niobate ( $\text{KNbO}_3$ ) crystals
7. Potassium titanyl phosphate (KTP) crystal growth control technology
8. Processes for growing radiation-hardened artificial crystals with the following properties

- (1) Quality factor (Q) value  $\geq 3 \times 10^6$
- (2) Inclusion level not less than International Electrotechnical Commission (IEC) Level A
- (3) Aluminum (Al) content  $\leq 1\text{ppm}$
- (4) Etch tunnel (腐蚀隧道) density  $\leq 10/\text{cm}^2$
9. Technology for preparing rare earth-iron (Tb-Dy-Fe system) ultra-magnetostrictive single-crystal materials
  - (1) Processes of non-polluting magnetic levitation cold crucible crystal growth with the Czochralski method
  - (2) Single crystal composition and structure control technology
10. Processes for growing lithium tetraborate and lithium triborate (LBO) crystals
11. Process for growing neodymium-doped yttrium aluminum borate (NYAB) crystals
12. Process for growing strontium barium titanate (SBT) crystals
13. Process for growing beta barium borate (BBO) crystals
14. Process for growing strontium beryllium borate (SBBO) crystals
15. Processing technology for potassium beryllium fluoroborate (KBBF) crystal growth and prism couplers
16. Growth process for lutetium-yttrium oxyorthosilicate (LYSO) crystals
17. Growth process for cerium-activated lanthanum bromide ( $\text{LaBr}_3:\text{Ce}$ )<sup>15</sup> crystals

## 32. 083003X

Technology name: Polymer matrix composite (PMC) production technology

Control points:

1. Production technology of fiber-reinforced resin matrix composites for spacecraft aeroshells
2. Production technology of fiber-reinforced resin matrix ablation-resistant, heat-insulating, heat-resistant composite materials for use in pressure vessels (pressure  $\geq 25\text{ MPa}$ )
3. Production technology of fiber-reinforced resin matrix ablation-resistant

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<sup>15</sup> Translator's note: The Chinese source text provides the Chinese term 溴化镧, which means "lanthanum bromide," and pairs it with the abbreviation  $\text{LaBr}_3:\text{Ce}$ , which stands for "cerium-activated lanthanum bromide."

composite materials with bulk density (容重) of 1.5 to 1.7 g/cm<sup>3</sup>, and ablation rate of  $\leq 0.22$  mm/s

4. Formulations of resin matrix in hot-melt process

### **Ferrous Metals Smelting and Rolling Processing**

33. 083101X

Technology name: Steel metallurgy technology

Control points:

1. Production technology of high-temperature alloys with high-temperature resistance  $\geq 850$  °C
2. Formulations and production technology of stealth materials for military use
3. Formulations and production technology of transpiration (sweating) cooling materials with high-temperature resistance  $\geq 2000$  °C

### **Non-Ferrous Metals Smelting and Rolling Processing**

34. 083201X

Technology name: Non-ferrous metals metallurgy technology

Control points:

1. Non-toxic (cyanide-free) heap leaching gold extraction technology and formulations
2. Technology and techniques for extracting metallic gallium from alumina mother liquor (母液) using methods such as ion exchange and ion exchange resin
3. Powdering and solidification (固结) processes for preparing beryllium material with strength  $\geq 520$  MPa
4. Manufacturing technology of high-temperature superconducting wires and ribbon cables with the following characteristics
  - (1) Critical temperature  $> 77$  K, length  $> 100$  m, critical current density  $> 1 \times 10^4$  A/cm<sup>2</sup> (at its own field strength [自场强下] at 77 K)
5. Manufacturing technology of high-temperature superconducting thin films with the following characteristics

- (1) Critical temperature  $> 77\text{ K}$ , area  $> 5\text{cm}^2$ , critical current density  $> 1 \times 10^6\text{ A/cm}^2$  (at zero field strength [零场强下] at  $77\text{ K}$ )
6. Rare earths mining, processing, and smelting technology (except for technologies already listed as prohibited from export)
7. Synthesis processes and formulations for rare earth extractants
8. Technology for altering and increasing rare earths in metal materials
9. Technology for extracting lithium from spodumene to produce lithium carbonate
  - (1) Technology for preparation of lithium carbonate from purified liquid containing lithium
  - (2) Carbonization pyrolysis purification technology
  - (3) Mother liquor reuse technology
  - (4) Automatic control technology for continuous production
  - (5) Lithium hydroxide carbonization technology
10. Technology for extracting lithium from spodumene to produce lithium hydroxide
  - (1) Technology for preparation of lithium hydroxide from purified liquid containing lithium
  - (2) Technology for frozen separation of sodium (冷冻析钠)
  - (3) Evaporation crystallization technology
  - (4) Automatic control technology for continuous production
  - (5) Crush-drying (粉碎干燥) technology
11. Technology for preparation of metallic lithium (alloys) and lithium materials
  - (1) Multi-anode electrolysis technology
  - (2) Technology for distillation purification of metallic lithium
  - (3) Rolling processing technology for metallic lithium (alloys) and lithium materials
12. Technology for extracting lithium from brine
  - (1) Adsorbent material synthesis technology (aluminum group, titanium group, manganese group)

- (2) Technologies that integrate brine adsorption and membrane separation lithium extraction techniques
- 13. Technology for preparation of purified liquids containing lithium
  - (1) Ion exchange impurity removal technology
  - (2) Technologies for removal of B, Ca, K, Na, S, etc. from solutions containing lithium
  - (3) Membrane separation and electrodialysis technologies for removing impurities

35. 083302X

Technology name: Amorphous and microcrystalline metal metallurgy technology

Control points:

- 1. Winding (卷取) technology for amorphous materials
- 2. Self-propagating high-temperature synthesis and preparation technology
  - (1) Preparation technology of hard, impact-resistant material
  - (2) Preparation technology of nanoscale grains (纳米级晶粒)
- 3. Preparation technology of nanoscale ultrafine powder

### **Metal Products**

36. 083301X

Technology name: Heat treatment technology

Control points:

- 1. Heat treatment technology for dies (模具)
  - (1) Rare earth-boron co-diffusant (共渗剂) formulations
  - (2) Rare earth-boron codiffusion (共渗) treatment process
- 2. Formulations and processes for codiffusion with rare earths, carbon, and nitrogen, and for codiffusion with rare earths and carbon
- 3. Formulations and heat treatment process for loader bucket teeth material

37. 083302X

Technology name: Metal matrix composite (MMC) materials production technology

Control points:

1. Preparation technology of metal-ceramic nanoscale materials
  - (1) Preparation technology of tungsten carbide-cobalt (WC-Co) submicron-scale powder
  - (2) Preparation technology of WC-Co submicron grain composite materials
2. Preparation technology of fiber-reinforced aluminum metal matrix composites
3. Preparation technology of super-hybrid (超混杂) aluminum metal matrix composite boards
  - (1) Modification (改性) process using bamboo materials (竹材)
  - (2) Modified bamboo material-reinforced aluminum composites process
  - (3) Vinylon-reinforced aluminum composites process
4. Technology of preparing composite materials through chemical vapor infiltration

### **General Purpose Equipment Manufacturing**

38. 083401X

Technology name: Casting technology

Control points:

1. Formulations of additives for high-temperature resistant coated sand
2. The following technologies for electroslag remelting of medium-sized and large, thin-walled, variably curved surface castings
  - (1) Setting (确定) various temperature fields under unsteady states
  - (2) Software packages for constructing variably curved surface components by electroslag remelting

39. 083402X

Technology name: General purpose equipment manufacturing technology

Control points:

1. Metal centrifuge rotor molding technology
  - (1) Corrugation process
  - (2) Drum (转筒) spinning process and surface treatment process

- (3) Rotor assembly and fine-tuning process
2. Manufacturing technology of metal centrifuge upper and lower dampers
  - (1) Upper damper shell molding process
  - (2) Assembly and adjustment process
  - (3) Upper and lower damping structure parameters, performance parameter detection principles and methods, and experimental test equipment used

#### 40. 083403X

Technology name: General purpose components manufacturing technology

Control points:

1. Integral forming (整体成形) process of titanium alloy spherical pressure vessels
2. Manufacturing technology of three-ring deceleration (or acceleration) transmission devices
  - (1) Selection of design parameters
  - (2) Manufacturing processes and technology

#### 41. 083404X

Technology name: Gas turbine manufacturing technology

Control points: Gas turbine high-temperature blade material production technology with all of the following indicators

1. Casting and processing of tantalum-free nickel metal matrix alloys
2. High-temperature corrosion-resistant coatings for surfaces with working temperature  $\geq 850^{\circ}\text{C}$ , and having a service life of  $\geq 10,000\text{h}$

#### 42. 203405X

Technology name: 3D printing technology

Control point: Key technologies of 'integrated casting-forging-milling' ( '铸锻铣一体化' ) metal 3D printing

#### 43. 203406X

Technology name: Basic general purpose technology of the machine tool industry

Control point: Technologies such as the innovative design, basic processes, testing and verification, reliability, and functional safety of high-end computer numerical control

(CNC) machines

44. 233407X

Technology name: Bulk material loading, unloading, and transport

Control point: Design and manufacturing technology of four-car railcar dumpers, large-scale ship loaders (>10,000 t/h), and large-scale ship unloaders (>3,600 t/h)

### **Specialized Equipment Manufacturing**

45. 083501X

Technology name: Refrigeration and cryogenic engineering technology

Control point: Design technology of dewars for temperature < 6K

46. 203502X

Technology name: Design and construction technology of large-scale, high-speed wind tunnels

Control point: Technologies for smart manufacturing and advanced testing of special function structural design, performance analysis of special metal/composite materials with wide temperature ranges, and large-scale complex equipment; high-power arc heater technology, high-power silicon controlled rectifier (SCR) power source technology, technology for high-enthalpy and long-duration operations, etc.

47. 203503X

Technology name: Large-scale vibration platform design and construction technology

Control point: Dual-axis self-synchronous vibration testing platforms, and 50-ton electrodynamic vibration testing systems

48. 203504X

Technology name: Design and manufacturing technology of core components of petroleum equipment

Control point: High-end downhole work tools and software for petroleum equipment, and design and manufacturing technology of key equipment for oil and gas gathering and transport, top drives, injector heads, hydraulic fracture tracers (压裂痕), liquid nitrogen pumps, liquid nitrogen evaporators, and other core well drilling and well completion components

49. 203505X

Technology name: Basic technology of large-scale petrochemical equipment

Control point: Materials technology, welding technology, heat treatment technology, processing technology, and testing technology of reactors, furnaces, heat exchangers, Horton spheres, and other static equipment for large-scale petrochemical and coal chemical installations

50. 203506X

Technology name: Design technology of new strategic products in the heavy machinery industry

Control point: Design technology of new strategic products in the heavy machinery industry, such as third- and fourth-generation nuclear power equipment and materials technology, and maritime industry equipment technology

### **Railroad, Shipping, Aviation, Spaceflight, and Other Transportation Equipment Manufacturing**

51. 083701X

Technology name: Ship design and testing technology

Control points:

1. Formulation and structure of float materials and sealing materials for underwater robots
2. Shallow draft and ultra-shallow draft full-form ship (肥大型船) technology
  - (1) Shallow draft full-form ship types: beam-to-draft ratio ( $B/T \geq 3.5$ ; block coefficient ( $C_b \geq 0.82$ )
  - (2) Ultra-shallow draft full-form ship types: beam-to-draft ratio ( $B/T \geq 4.0$ ; block coefficient ( $C_b \geq 0.82$ )
3. Hovercraft skirt technology
4. Designs and testing technology of wing-in-ground-effect vessel types (冲翼艇船型)
5. Technology of airfoil craft types (气翼艇船型)
6. Pump-jet propulsion design technology and technology for prediction of the speed performance (快速性预报) of pump-jet propulsion
7. Reverse thruster (倒车舵), ducted propeller (导管舵), and flap rudder (襟翼舵) propulsion operating system technology for inland waterway pushers and tugboats ( $1.1 \leq (\text{propeller diameter/draft}) \leq 1.4$ )

8. Stern flow field (艏型流场) technology for inland waterway vessels ( $1.1 \leq$  (propeller diameter/draft)  $\leq 1.4$ )
9. Propeller boss cap (毂帽) technology for ship propeller flow correction
  - (1) Technology for eliminating propeller boss cap cavitation
  - (2) Cap shape and small-blade wing-style (小叶翼型) propeller profiling design methods
10. Ship oil-water separation technology

52. 083702X

Technology name: Marine equipment manufacturing technology

Control points: Docking and departure sonar for ships (船舶靠岸声纳)

1. Software
2. Transducer manufacturing process
3. Signal processing modules

53. 083703X

Technology name: Shipbuilding processes

Control points:

1. Anti-deformation technology for casting copper alloy propellers with diameter  $> 3$  m
  - (1) Deformation of blade pressure surface pitch and blade inclination angle
  - (2) Reduction of machining tolerance on the back side of the blade to ensure optimal geometry
2. Diesel engine double-layer vibration isolation technology

54. 083704X

Technology name: Marine materials manufacturing technology

Control point: Chemical formulations and manufacturing processes of various series of polymer materials for vibration and noise reduction

55. 083705X

Technology name: Aircraft design and manufacturing technology

Control point: Source code for calculating subsonic ( $< 340$  m/s) aerodynamics of complex assemblies

56. 083706X

Technology name: Aircraft components manufacturing and testing technology

Control point: Speed regulation and testing system of helicopter rotary wing dynamic balancing test bench

57. 083707X

Technology name: Aviation materials production technology

Control points:

1. Preparation technology of aluminum-lithium alloys containing rare earths
  - (1) Types and amounts of rare earth elements and methods for adding rare earth elements
2. Production technology of directional solidification high-temperature alloys containing both tungsten (W) and hafnium (Hf) in amounts of 1.5% to 2.5%
  - (1) Selection and control of alloy composition
  - (2) Smelting process and directional crystallization process
  - (3) Heat treatment workflows and specifications
3. Production technology of multipolar anisotropic cast magnets
  - (1) Manufacturing process
  - (2) Magnetic measurement technology
4. Preparation technology of interlayer alloys for use in single-crystal turbine blade attachment
  - (1) Composition of nickel-cobalt-chromium-tungsten-hafnium (Ni-Co-Cr-W-Hf) alloys
  - (2) Preparation process of interlayer alloys

58. 203708X

Technology name: Technology of sea island and reef utilization and security assurance equipment

Control point: Equipment technology of maritime law enforcement command and dispatch systems, large and ultra-large floating security bases,<sup>16</sup> very large maritime floating airports and ports, maritime satellite launching platforms, medium-sized

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<sup>16</sup> Translator's note: A "floating security base" (浮式保障基地) is a large floating platform that supports a base used by the Chinese military or Coast Guard to enforce China's maritime claims to islands or offshore resources.

floating platforms for islands and reefs, construction installations for the development and construction of distant sea (远海) islands and reefs, and support platforms for distant sea communication network systems

59. 203709X

Technology name: Aviation and spaceflight bearing technology

Control point: Rocket engine bearing technology, and technology of long-life bearings for satellites

### **Electrical Machinery and Equipment Manufacturing**

60. 083801X

Technology name: Electrical wire and cable manufacturing technology

Control points:

1. Formulations and preparation processes of non-combustible cable insulation materials that meet all of the following conditions
  - (1) Service temperature  $> 250^{\circ}\text{C}$
  - (2) Non-combustible in  $800^{\circ}\text{C}$  open flame  $\geq 1.5$  h
  - (3) Withstands voltage  $\geq 2,500$  V
2. Manufacturing process of symmetrical radio frequency (RF) cables for nuclear power plants
3. Formulations and manufacturing processes of rare earth aluminum conductors (导线) for electrical conduction
4. Formulations of polyvinyl chloride (PVC) cable material for high-speed extrusion
5. Manufacturing processes of power, control, and instrumentation cables for nuclear power plants
6. Manufacturing process of high-temperature ( $120^{\circ}\text{C}$ ) aluminum-sheathed submersible oil pump cables

### **Computers, Communications, and Other Electronic Equipment Manufacturing**

61. 083901X

Technology name: Electronic device manufacturing technology

Control points:

1. Broadband miniaturized isolator manufacturing technology
  - (1) Designs and manufacturing processes of multi-octave-spanning (超倍频程) broadband (fractional bandwidth  $\geq 70\%$ ) miniaturized isolators
  - (2) Formulations and preparation processes of ferrite material with very narrow ferromagnetic resonance linewidth of  $\Delta H < 2$  oersteds
  - (3) Ultra-wideband (fractional bandwidth  $\geq 70\%$ ) matching technology and wide temperature range ( $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ) compensation technology
2. Design technology and manufacturing process of broadband (2 to 8 GHz) suspended stripline frequency dividers
3. Piezoelectric gyro sensor manufacturing technology
  - (1) Support system design and manufacturing process
  - (2) Piezoelectric transducer bonding process
  - (3) Structural design, processes, and heat treatment technology of metal vibrating cantilever beams (振梁)
  - (4) Structural designs and assembly technology of zero self-calibration (校零) systems
  - (5) Zero self-calibration signal processing technology
4. Surface acoustic wave (SAW) device design technology
  - (1) SAW filters (frequency  $> 2$  GHz, out-of-band suppression (带外抑制)  $> 70$  dB, insertion attenuation  $< 1.5$  dB)
  - (2) SAW tap delay line (code bits [码位]  $> 1023$  bits, operating frequency  $> 600$  MHz)
  - (3) SAW convolver (code bits  $> 1023$  bits, operating frequency  $> 600$  MHz)
  - (4) SAW fixed delay line (frequency  $> 2$  GHz, delay time  $> 300$   $\mu\text{s}$ )
  - (5) SAW dispersive delay line (frequency  $> 500$  MHz, time-bandwidth product  $> 10,000$ , sidelobe suppression  $> 32$  dB)
  - (6) SAW pulse compression line (sidelobe suppression  $> 32$  dB, second-order clutter signal simulation and calculation technology, weighted compensation method for secondary lobe [副瓣] suppression, phase error compensation technology)

5. SAW device manufacturing technology
  - (1) Assembly technology
  - (2) Matching technology
  - (3) Large-area (220 mm × 20 mm) photolithography technology
6. Designs and manufacturing technology of standing-wave accelerator tube-based, back bombardment-resistant electron guns
7. Designs and focusing technology of multi-beam klystrons
8. Ion beam processing technology to improve gridded electron emission (栅网电子发射)

#### 62. 083902X

Technology name: Semiconductor device manufacturing technology

Control points:

1. High-power, optically controlled, bi-directional thyristor with a center-tapered groove-shaped (中心锥形槽状) photosensitive gate
  - (1) Chromium-nickel-silver (Cr-Ni-Ag) barrier metal sintering technology
  - (2) Silicon dioxide (SiO<sub>2</sub>) and silicon nitride (Si<sub>3</sub>N<sub>4</sub>) insulating film gate formation process
2. Manufacturing technology of diodes with conductivity resistance (导电电阻) < 2 Ω
3. Raw material preparation technology and epitaxial technology for single-crystal luminescent screens (发光屏)

#### 63. 083903X

Technology name: Sensor manufacturing technology

Control points:

1. Design, manufacturing, and calibration technology of Hall probes for electron collider spectrometers
2. Designs and manufacturing technology of remote field eddy current testing probes

#### 64. 083904X

Technology name: Microwave technology

Control points: High-power (100 MW) microwave technology

1. Pulsed power technology and high-current electron beam acceleration technology
2. Explosive magnetic flux compression technology

65. 083905X

Technology name: Optical fiber manufacturing and fiber-optic communications technology

Control points:

1. Manufacturing technology of carbon dioxide (CO<sub>2</sub>) laser transmission fiber
  - (1) Composition and preparation technology of glass optical fiber with optical loss < 1 dB/m at 10.6 μm [wavelength]
  - (2) Preparation technology of photonic crystal fiber with optical loss < 0.5 dB/m at 10.6 μm
  - (3) Preparation technology of hollow-core fiber with optical loss < 1 dB/m at 10.6 μm
2. Technology for double crucible fabrication and 20-hole crucible optical glass fiber drawing
3. Process parameters of optical fiber drawing and coating pipeline (拉丝被覆流水线) technology
4. Programmable digital phase-locked loop frequency synthesis (可编程数字锁相频率合成) technology; direct digital synthesis + phase-locked loop (DDS+PLL) frequency-hopping signal source

66. 083906X

Technology name: Computer core hardware manufacturing technology

Control points:

1. Supercomputer (巨型计算机) (≥ 97 trillion operations per second) manufacturing technology
  - (1) Overall design technology
  - (2) Mainframe (主机) and operating system technologies
  - (3) Manufacturing and development technologies for mainframes, auxiliary machines (辅机), and external devices
2. Technology for achieving multiport memory high-speed communication

mechanisms in parallel computers

3. Design technology for bus and interrupt control of fully symmetric multiprocessors (全对称多处理机) in parallel computers

#### 67. 083907X

Technology name: Wireless communications technology

Control points:

1. Antenna array technology
  - (1) Wideband (center frequency  $\geq 100\%$ ) antenna arrays that span more than one octave band
  - (2) Wideband ( $> 800$  MHz in C-band) feed precision processing technology
2. Processes and technology of microwave direct modulation frequency-division phase-locked solid-state sources (微波直接调制分频锁相固态源) processing
3. Integrated acousto-optical heterodyne receiver (集成声光外差接收) technology with bandwidth  $> 100$  MHz and dynamic range  $> 90$  dB
4. Rapid capture technology for code-division multiple access (CDMA) burst signals (突发信号) with carrier-to-noise density ratio ( $C/N_0$ ) below 46 dB-Hz

#### 68. 083908X

Technology name: Robot manufacturing technology

Control points: Manufacturing and control technology of autonomous and semi-autonomous underwater robots

#### 69. 083909X

Technology name: Technology for metrology-based, standards-adhering manufacturing (计量基、标准制造), and for quantity value transmission<sup>17</sup>

Control points:

1. Manufacturing technology for toroidal inductors with accuracy  $\leq 2 \times 10^{-4}$  and annual stability (年稳定性)  $\leq 10^{-4}$

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<sup>17</sup> Translator's note: "Quantity value transmission" (量值传递) is a Chinese term that refers to the ability to make extremely precise and accurate measurements using metrology equipment, so as to ensure that manufactured products adhere to established standards.

- (1) Inductor coil winding and shielding technology
- (2) Toroidal inductor coil temperature compensation technology
- (3) Moisture-proofing and earthquake resistance technology
2. Structural design of radio frequency (RF) voltage standard RF printed circuit board (PCB) mount connectors (射频座), and manufacturing technology of thin-film spoke-shaped thermistors and rheostats (热变电阻)
3. Standard time satellite transmission technology
4. Manufacturing processes and parameters of helium-neon frequency stabilization (wavelength relative variation  $\Delta\lambda/\lambda = 10^{-10}$  to  $10^{-11}$ ) optical iodine chambers, laser tubes, and resonant cavities (光器碘室、激光管、谐振腔镜)
5. Manufacturing technology of electrical substitution radiometer absorber cavities (接收腔)
  - (1) Manufacturing process of metal cavities in electrical substitution radiometers with absorption rate  $\geq 0.998$
  - (2) Manufacturing technology of electric heaters for metal cavities

#### 70. 083910X

Technology name: Space materials production technology

Control points:

1. Formulations and production processes of ablative materials for recoverable satellites<sup>18</sup>
2. Formulations and production processes of catalysts for satellite attitude control thrusters

#### 71. 083911X

Technology name: Manufacturing technology of space instruments and equipment

Control points:

1. Manufacturing technology of remote sensing imaging spectrometers with

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<sup>18</sup> Translator's note: The Chinese term 返回式卫星 (Pinyin: fǎnhuíshì wèixīng) refers both to recoverable satellites generally and, specifically, to Fanhui Shi Weixing (FSW), China's first reconnaissance satellite program. FSW satellites were used for military reconnaissance and civilian imagery tasks and completed 23 missions between November 1974 and April 2016.

channel count > 500

2. Designs and technologies, evaluation methods and equipment, and space lubrication methods and lubricators of special devices for space environments
3. Overall technical plans and main technical indicators for high-resolution synthetic aperture radar (SAR) technology
4. Overall plans and indicators for high-resolution visible light and infrared imaging technology
5. Overall technical plans and indicators for millimeter-wave and submillimeter-wave space-based space target detection technology

## 72. 203912X

Technology name: Unmanned aerial vehicle (UAV) technology

Control points:

1. For micro-mission (微型任务) payloads in different grades of fixed-wing and rotary-wing UAVs, key technologies such as autonomous navigation, adaptive control, sensing and evasion, high-reliability communications, airworthiness, and airspace management
2. Key technologies of sensor types involved in UAV manufacturing, such as inertial measurement units, tilt sensors, atmospheric monitoring sensors, current sensors, magnetic sensors, and motor flow sensors
3. Counter-UAV technologies such as electromagnetic interference ray guns (电磁干扰射线枪)
4. Key technologies for UAV mission payloads (manufacturing technology for photoelectric/infrared sensors, SAR, LiDAR, etc.)
5. UAV flight control systems (algorithms and software relevant to autonomous navigation, path and obstacle avoidance planning, etc.)

## 73. 203913X

Technology name: Laser technology

Control point: Key technology for manufacturing deep-ultraviolet (DUV) solid-state lasers utilizing independently developed (自主研发) KBBF single crystals

## 74. 233914X

Technology name: LiDAR systems

Control point: Technology of laser probe and distance measurement systems meeting any one of the following conditions: Pulse peak power >30 kW, pulse width < 1 ns, detection range > 2 km, angular accuracy < 40  $\mu$ rad, angular resolution < 20  $\mu$ rad, or ranging accuracy < 2 mm

75. 083915X

Technology name: Computer applied technologies

Control points:

1. Intelligent workstations for parallel graph (并行图) reduction
2. Computer-integrated manufacturing system (CIMS) experimental engineering

### **Instrumentation Manufacturing**

76. 084001X

Technology name: Manufacturing technology of thermal measuring instruments and meters

Control points: Manufacturing technology of dual vortex flow meters with all of the following indicators

1. For pipe diameters from 50 to 2,000 mm
2. Measurement accuracy higher than 0.5%
3. Flow rate  $\geq 0.2$  m/s
4. Piped medium is water and temperature  $\leq 300$  °C steam

77. 084002X

Technology name: Manufacturing technology of mechanical measuring instruments and meters

Control points: High-precision roundness measuring machines

1. Large size ( $\Phi 250$  to  $\Phi 1,000$ ) online measurement (在线测量) technology for roundness and cylindricity
2. Error separation and error compensation technology for improving axial rotation (主轴回转) precision and measurement precision ( $\pm 0.017$   $\mu$ m).

78. 084003X

Technology name: Nondestructive defect detection technology

Control points: Manufacturing technology of accelerator tubes for standing-wave electron linear accelerators for defect detection

79. 084004X

Technology name: Manufacturing technology of materials testing machines and instruments

Control points:

- 1 Online, dynamic, and synchronized testing technology for mount (贴片) photoelasticity
2. Liquid hydrogen high-speed (> 40,000 rpm) bearing testing machine design technology
  - (1) Deformation control technology for main bearings (主轴) at low temperatures (below -240 °C)
  - (2) Thermal conduction and thermal isolation technology
  - (3) Loading systems (加载系统)

80. 084005X

Technology name: Chronometric instrument manufacturing technology

Control points:

1. Image sensing technology and control methods of specialized charge-coupled devices (CCDs) for photo finish timing and interpretation equipment
2. Sensing method and production process of touchscreens in complete sets (成套) of specialized timing and scoring equipment for swimming (and finswimming)

81. 084006X

Technology name: Precision instrument manufacturing technology

Control points:

1. High-definition (resolution > 20  $\mu\text{m}$  at 5.1 mm) reflection acoustic microscopes (反射式声显微镜)
  - (1) Acoustic mirror manufacturing technology
  - (2) Principles of acoustic mirror imaging and V(Z) curves, and

shadowgraph<sup>19</sup> methods

2. Research on modern laser photometry of diesel engine modes of vibration
  - (1) Aspheric lens designs and manufacturing technology
  - (2) Design structure and construction technology of dual optical path systems (二路光路系统)
3. 4-point probe (四坐标探针) displacement mechanism technology
  - (1) Designs and manufacturing processes of 4-point displacement mechanisms
  - (2) Designs and manufacturing processes of high frequency response ( $\geq 20$  kHz) pressure probes

82. 084007X

Technology name: Cartographic technology

Control points:

1. Key algorithms and systems of Chinese geographic information systems (GIS) with topographic and geographic coordinate data at a scale of  $> 1:1,000,000$
2. Applied technology of direct-output (直接输出) topographic elements with scale  $\geq 1:100,000$

83. 084008X

Technology name: Seismic observation instrument production technology

Control points:

1. Production technology of seismometers with observation bands up to direct current (DC) and sensitivity  $\geq 1,000 \text{ V}\cdot\text{s/m}$
2. Production technology of borehole three-component seismometers with borehole diameter  $< 130 \text{ mm}$ , period  $> 1 \text{ s}$ , and sensitivity  $\geq 500 \text{ V}\cdot\text{s/m}$

84. 084009X

Technology name: Glass and amorphous, inorganic, nonmetallic materials production technology

Control points:

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<sup>19</sup> Translator's note: The Chinese text of this document misspells the term "shadowgraph" (阴影成像) as 阴影成象.

1. Manufacturing technology of small multi-head ion sources for plating machines
  - (1) Ion beam-assisted evaporation (离子束辅助蒸发) process
  - (2) Ion beam spot (离子束斑) synthesis technology
2. Composition of F1 strengthened platinum (F1 强化铂) for making crucibles, and its production technology

### **Production and Supply of Electricity and Heat**

85. 204401X

Technology name: Large electric power equipment design technology

Control point: Technology of complete sets of equipment for the clean and efficient utilization and flexible use of coal, large-scale hydropower unit (水电机组) design technology, advanced nuclear power unit (third-generation pressurized water reactor, small reactor, high-temperature gas-cooled reactor, etc.) design technology, design of complete sets of ultra-high voltage AC and DC power transmission and distribution equipment, and other key technologies

### **Water Transportation**

86. 085501X

Technology name: Key technology for container loading and unloading

Control point: Design and manufacturing technology for complete sets of technical equipment for container ports, including technology for lashing and securing (绑控) extra-large items for marine transportation, technology for automated container terminal equipment control systems, and integrated technology for the full life cycle of container cranes

### **Telecommunications, Radio, Television, and Satellite Transmission Services**

87. 086301X

Technology name: Communication transmission technology

Control points:

1. Secrecy protection technology for radio and television networks and for telecommunications networks
  - (1) Cipher design technology

2. Information transmission, encryption, and decryption technologies developed by China and used in military fields
3. Technology of underwater, low-frequency electromagnetic communication
  - (1) Applications of underwater, low-frequency electromagnetic field communication technology
  - (2) Low noise amplification technology
  - (3) High sensitivity and anti-interference technologies

88. 086302X

Technology name: Computer network technology

Control point: Supercomputer ( $\geq 97$  trillion operations per second) network systems and parallel processing technology

89. 086303X

Technology name: Space data transmission technology

Control point: Production technology of media (介质材料) with loss less than  $10^{-4}$  for use in  $K_u$  band planar antennas

90. 086304X

Technology name: Satellite applied technologies

Control point:

1. BeiDou satellite navigation and positioning systems involving one of the following elements
  - (1) Signal formats, device structures, and manufacturing processes of inbound signal real-time capture units
  - (2) Signal capture methods, circuit structures, and specialized chips (专用芯片) for outbound signal rapid capture units
  - (3) Information transmission systems, modulation methods, and frame structures (帧结构) of the systems

### **Internet and Related Services**

91. 206401X

Technology name: Cryptographic security technology

Control points:

1. Cryptographic chip design and actualization technology (high-speed cryptographic algorithms, parallel encryption technology, security design technology for cryptographic chips, cryptographic system-on-chip [SoC] design and actualization technology, and actualization technology for high-speed chips based on high-speed algorithm standards)
2. Quantum cryptography. Quantum cryptography actualization methods, transmission technology, network technology, engineering actualization technology, etc.

92. 206402X

Technology name: High-performance detection technology

Control points:

1. Deep packet inspection technology in high-speed network environments with speed  $\geq 500$  Gbps
2. Unknown attack (未知攻击) behavior acquisition and analysis technology
3. Strategic early-warning technology based on large-scale information collection and analysis
4. Network early warning coordinated response technology for large-scale networks
5. Advanced persistent threat (APT) attack detection technology
6. Threat intelligence generation technology
7. Technology related to specialized equipment for secure processing on high-traffic networks
  - (1) Access circuits (接入路线) with bandwidth reaching 500 Gbps or higher
  - (2) Rule capacity (规则容量) reaching 100,000 or higher
  - (3) Number of users reaching 4 or higher

93. 206403X

Technology name: Information defense technology

Control points:

1. Information hiding (信息隐藏) and discovery technology
2. Information analysis and monitoring technology
3. Rapid system and data recovery technology

4. Trusted computing technology

94. 206404X

Technology name: Information countermeasure technology

Control points:

1. Traffic capture and analysis technology
2. Vulnerability discovery and mining technology
3. Malicious code compilation and injection technology
4. Information camouflage (信息伪装) technology
5. Cyberattack tracking and tracing technology

**Software and Information Technology Services**

95. 086501X

Technology name: Information processing technology

Control points:

1. Intelligent text-to-speech development tool technology for Chinese characters
2. Design and manufacturing processes of character-based Chinese character display controllers
3. Core and key technologies (核心技术) of computerized Chinese text systems
4. Engineering drawing computer-aided design (CAD) and file management system hybrid raster/vector information processing methods
5. Chinese text platform technology (core technology of Chinese text processing)
6. Technology for translation from Chinese into foreign languages (with a > 4.5 out of 5 Machine Translation Assessment Score)<sup>20</sup>

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<sup>20</sup> Translator's note: "Machine Translation Assessment Score" (MTAS; 机器翻译系统得分) is probably a reference to the industry standard (literally, "group standard"; 团体标准) standard T/CESA 1039-2019, "Information technology-Artificial intelligence-Graded assessment for machine translation capabilities" (信息技术 人工智能 机器翻译能力等级评估), promulgated by the China Electronics Standardization Association (CESA; 中国电子工业标准化技术协会) on April 1, 2019. The MTAS (机器翻译系统能力得分) grades machine translation (MT) on a 0-5 scale. The full text of T/CESA 1039-2019 is available online

7. Ethnic minority language processing technology
8. Specialized speech recognition technology for Chinese (汉语) and for ethnic minority languages
9. Chinese character compression and restoration technology
10. Print-style (印刷体) Chinese character recognition technology, program structure, main algorithms, and source code
11. Chinese character processing technology and inter-network control technology of videotex systems
12. Offline handwritten Chinese character recognition systems and methods with interactive and self-learning functions
13. Samples of handwritten-style (手写体) Chinese characters, samples of print-style Chinese characters, and Chinese corpora for computerized Chinese character input recognition methods
14. Feature extraction methods for Chinese character recognition, and source code of technology for achieving text segmentation
15. Specialized speech synthesis technology for Chinese and for ethnic minority languages
16. Specialized artificial intelligence (AI) interactive interface technology for Chinese and for ethnic minority languages
17. Specialized smart exam paper grading technology for Chinese and for ethnic minority languages
18. Data analysis-based personalized information push service technology (user personalized preference learning technology, user personalized preference real-time perception technology, information content feature modeling technology, analytic technology for matching user preferences with information content, large-scale distributed real-time computing technology for supporting recommendation algorithms, and so on, based on continuous training and optimization with massive data)

96. 086502X

Technology name: General purpose computer software programming technology

Control points:

1. Supercomputer ( $\geq 97$  trillion operations per second) software technology

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(in Chinese) at: <https://perma.cc/4A9M-Y5NP>.

2. Technology for implementing microkernels and multithreading in parallel computers, technology for identifying program parallelism (程序并行性), and source code for parallel-optimized compilation

97. 206503X

Technology name: System software (基础软件) security enhancement technology

Control points:

1. Operating system security enhancement technology: Level 4 or above technical requirements in "Security technical requirements for operating systems" (GB/T 20272-2006)<sup>21</sup>
2. Database system security enhancement technology: Level 4 or above technical requirements in "Security technical requirements for database management systems" (GB/T 20273-2006)<sup>22</sup>

### Professional Technical Services

98. 087401X

Technology name: Marine environment emulation technology

Control points:

1. Marine environment emulation, background interference emulation
2. Interpolated filtering technology and technology for correcting latency differences in simulation channels
3. Modeling

99. 087402X

Technology name: Geodetic technology

Control point: Overall adjustment (整体平差) method and software technology of geodetic control networks in China

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<sup>21</sup> Translator's note: The Chinese national standard "Information security technology—Security technical requirements for operating systems" (信息安全技术 操作系统安全技术要求) (GB/T 20272-2006) was superseded by an updated standard with the same name but a new identifier—GB/T 20272-2019—in 2020. The full text of GB/T 20272-2006 is available (in Chinese) at: <https://perma.cc/4QWF-8LRF>.

<sup>22</sup> Translator's note: The Chinese national standard "Information security technology—Security technical requirements for operating systems" (信息安全技术 操作系统安全技术要求) (GB/T 20273-2006) was superseded by an updated standard with the same name but a new identifier—GB/T 20273-2019—in 2020.

100. 087403X

Technology name: Precision engineering survey (精密工程测量) technology

Control point: Technologies and methods of precision measurement (精密测量) for China's key projects

101. 087404X

Technology name: Vacuum technology

Control point: Ultra-high vacuum acquisition (获取) technology for vacuum  $< 10^{-9}$  mPa

102. 087405X

Technology name: Acoustical engineering technology

Control points:

1. Specialized system design technology and algorithm software for active noise control for aviation, spaceflight, ships, and trains
2. Design technology and manufacturing processes of aeroacoustic sound sources with sound power  $> 10,000$  W

103. 087406X

Technology name: Measurement and testing technology

Control points:

1. Sulfur hexafluoride trace water content measurement technology
  - (1) Manufacturing technology of sensors with a detection limit of 30 parts per million (volume fraction)
2. Sodium chloride temperature fixing technology (氯化钠温度定点技术)
  - (1) Density value of sodium chloride at phase equilibrium
  - (2) Seal cavity (密封腔) thermal conduction improvement technology and corrosion prevention technology
  - (3) Fixed-point blackbody (定点黑体) anti-leakage technology

104. 207407X

Technology name: Aerospace remote sensing image acquisition technology

Control point: Aerospace remote sensor (航天遥感器) technology, including aviation remote sensor (航空遥感器) emulation (ground and aviation) technology, and remote sensing data encoding technology

105. 087408X

Technology name: Geophysical survey technology

Control point: Manufacturing technology of optically pumped helium magnetometer probes with geomagnetic field determination sensitivity  $\leq 0.01$  nT (including single optical systems [单光系] and multi-optical systems [多光系])

## Health

106. 088401X

Technology name: Medical technology of traditional Chinese medicine

Control points:

1. Medical principle designs (医理设计) and effective prescriptions of the disease diagnosis and treatment systems of National Famous Veteran Doctors of Traditional Chinese Medicine (国家名老中医) and those who have won first or second prizes of science and technology progress at the provincial and ministerial level (省部级) or above.
2. Technology of femoral neck reconstructive surgical treatment for neck resorption following femoral neck fracture, complicated by osteonecrosis of half of the femoral head (股骨颈重建术治疗股骨颈骨折颈吸收伴头缺血性坏死的技术)

## Culture and Art

107. 088801X

Technology name: Technology of cultural relic protection and restoration

Control points:

1. Catalyst application and formulas of dehydration and shaping technology for ancient waterlogged lacquered wood objects
2. Uncovering and mounting techniques of ancient calligraphy and paintings

108. 088802X

Technology name: Cultural relic reproduction technology

Control points:

1. Ancient silk fabric reproduction technology
2. Emulsion formulation process in technology for the photographic reproduction of ancient calligraphy and paintings

3. Surface treatment process of ancient bronze mirrors

109. 088803X

Technology name: Large-scale bronze reproduction technology

Control points:

1. Ancient chime bell (bianzhong; 编钟) set reproduction technology
2. Restoration technology of copper carriages and horses unearthed from the mausoleum of the First Emperor of the Qin Dynasty (Qin Shi Huang), etc.