
Additive Manufacturing in China

Policies

1. Circular of the Ministry of Science and Technology, the Development and Reform Commission and the Ministry of Industry and Information Technology on the Issuance of the Medium and Long-term Development Plan for the Automobile Industry (April 2017)

One of the key tasks is to focus on solving the micro-forming mechanism, process control, defect characteristics analysis and other scientific problems in the field of add-on manufacturing, breaking through a number of key forming processes and equipment products, developing applications in aerospace, automotive energy, household appliances, biomedical and other fields, leading the development of add-on manufacturing industry. A relatively perfect technological innovation and R&D system for innovative design, materials and preparation, technology and equipment, core components, metrology, software, standards, etc. will be formed. Application demonstration will be carried out in accordance with major needs, and the technological basis for large-scale industrial application will be provided.

- Scientific Basis of Controllability in additive manufacturing: to explore the forming rules and key influencing factors and control methods of geometric accuracy, forming efficiency, material structure and properties in free forming process of augmented material manufacturing, provide solid scientific support for upgrading the level of augmented material manufacturing technology and equipment design, and provide scientific guidance for the formation of new technology of major original augmented material manufacturing.
- Structural Optimum Design Technology Based on Additive manufacturing: to develop the structural optimization design technology based on the characteristics of the additive manufacturing process, which integrates mechanics, physics and chemistry functions. Provide design methods and software for the structural integration, lightweight, high performance and multi-functionalization of acoustics, optics, electricity, magnetism and heat, and support the independent innovation design and leapfrog technological development of high-end equipment in China.
- Manufacturing Technology of Special Material for Additive manufacturing: based on the technological characteristics and application requirements of augmented material manufacturing, research on the design and preparation technology of special metal and non-metal materials for augmented material manufacturing, to maximize the technical advantages of augmented material manufacturing and greatly expand the industrial application fields of augmented material manufacturing.
- Design and Manufacturing Technology of Core Equipment for Additive manufacturing: to aim at the material-adding manufacturing technologies that have shown great industrialized application value, such as laser/electron beam selective melting, laser selective sintering, high-energy beam metal deposition

forming, photo-curing, laser deposition printing, micro-droplet jet 3D printing, molten deposition modeling and so on, this paper carries out in-depth research on relevant equipment design and manufacturing technology, and occupies the high end of the value chain of the material-adding manufacturing industry.

- Evaluation System and Standard Construction: to study and formulate the standard system of material standard, design standard, process standard, equipment standard, testing standard, data standard and service standard for the additive manufacturing, lay the foundation for the extensive industrial application of the additive manufacturing, and significantly enhance the international competitiveness of the additive manufacturing technology in China.

2. **Ministry of Industry and Information Technology and other 12 ministries and commissions "Additive Manufacturing Industry Development Action Plan (2017-2020)" in November 2017.** The targets include:

- By 2020, the annual sales revenue of the additive manufacturing industry will exceed 20 billion yuan, with an average annual growth rate of more than 30%. Key core technologies have reached the international level of synchronous development, technological equipment has basically met the needs of industry applications, ecological system construction has been significantly improved, large-scale applications have been achieved in some areas, and international development capacity has been significantly improved.
- Breakthrough more than 100 key industries to apply urgently needed process equipment, core devices and special materials, and greatly improve the quality and supply capacity of added materials manufacturing products. The key core technologies of the key links in the industrial chain, such as special materials, process equipment and so on, have been developed synchronously with the international level, and some areas have reached the international advanced level.
- More than 100 pilot demonstration projects with wide application scope and remarkable implementation effect will be carried out, and a number of demonstration enterprises and parks with outstanding innovative capabilities and distinctive characteristics will be cultivated to promote the large-scale application of additional materials manufacturing in the fields of aviation, aerospace, ships, automobiles, medical treatment, culture and education.
- To cultivate and form a complete manufacturing industry chain of additives from materials, processes, software, core components to equipment, covering measurement, standards, testing, certification and other additives manufacturing ecological system. Build a number of public service platforms and form a number of industrial agglomeration areas.

The key tasks cover:

- Strengthen the construction of the innovation system of additive manufacturing. We will improve the operation mechanism of the National Innovation Center for Additional Material Manufacturing and encourage provincial innovation

centers for Additional Material Manufacturing to be built in areas with industrial foundation and technical conditions. Establish an innovative system of additive manufacturing with enterprises as the main body, market as the guidance, intellectual property rights benefit sharing mechanism as the link and government, industry, University and research as the coordination, promote forward-looking, common technology research and transformation of advanced scientific and technological achievements in the field of additive manufacturing, and create a number of industrial technological innovation platforms.

- Strengthen the research and development of key common technologies. Focusing on improving the basic research ability and the upstream and downstream technological level of augmented material manufacturing,
- Actively follow up the development trend of augmented material manufacturing technology, compile the road map of augmented material manufacturing technology development, and advance the layout of new generation of augmented material manufacturing technology research.
- Improve the quality of special materials for added materials manufacturing. Develop the research on the characteristics of special materials for additive manufacturing, promote the research and development of key materials preparation technology and equipment for additive manufacturing, encourage the production enterprises of superior materials to engage in the transformation of special materials for additive manufacturing and research results, improve the quality and performance stability of special materials for additive manufacturing, and form a number of special materials brands that basically meet the needs of additive manufacturing industry.
- Improve the quality of add-on manufacturing equipment, core components and software. We should strengthen the research and development of advanced mainstream augmented material manufacturing technology, improve the level of integrated innovation, focus on breaking through the quality, performance and stability of augmented material manufacturing equipment, core components and special software, accelerate the development and application of optoelectronic devices and integrated circuits for augmented material manufacturing equipment, and improve the supply level and capacity.
- Improve the quality of service in the manufacturing of additional materials. Promoting the capacity building of service quality assurance, by strengthening the production and demand docking between enterprises and users, enterprises are encouraged to provide comprehensive solutions in key application areas, such as pre-design, product supply, operation and maintenance, inspection and certification, to enhance the overall service quality of the industry and the user's acceptance of the additive manufacturing technology.
- Promote demonstration application. Taking direct manufacturing as the main strategic orientation, taking into account both prototype design and die development and application, we will promote the large-scale application of additive manufacturing in key manufacturing, medical, cultural and creative education and other fields. Using the new mode of adding material

manufacturing cloud platform, we can get through the application path of adding material manufacturing in society, enterprises and families online and offline.

- Establish and perfect the metering system of additive manufacturing. Aiming at the measurement needs of special materials, manufacturing equipment and core components in the field of additive manufacturing, we should strengthen the research of measurement and testing technology with industrial characteristics, develop special measurement and testing equipment for additive manufacturing, provide "full traceability chain, full life cycle, whole industry chain" and forward-looking measurement and testing technology services for additive manufacturing, and constantly improve the additive manufacturing. Industrial metrology testing service system.
- Improve the standard system of additive manufacturing. Strengthen the main position of enterprises in standardization activities, intensify efforts to carry out the revision of the standard of additive manufacturing, constantly improve the standard level, enhance the effective supply of standards, and support and guide the development of additive manufacturing industry with standards.
- Establishment of inspection and certification system for additive manufacturing. Focusing on the equipment, core components, special materials and products of the additive manufacturing process, the basic theory and method of testing technology and product characteristics are developed, and the testing system of the additive manufacturing is gradually established. According to the application requirement of add-on manufacturing technology, the core technology research such as accreditation evaluation analysis and quality assurance of add-on manufacturing is carried out, and the solution of accreditation technology suitable for add-on manufacturing is put forward. We will strengthen cooperation with foreign inspection and certification agencies for additive manufacturing, accelerate the formation of a number of specialized inspection and certification agencies for additive manufacturing, and promote the coordinated development of standards, testing and certification for additive manufacturing.

Standardization

1. Standards issued

No.	Code	Name	ICS	CCS	TC	Date issued	Adoption	Adoption type
1	GB/T 35021-2018	Additive manufacturing— Process categories and feedstock	25.030	J04	TC562	2018-05-14	ISO 17296-2:2015	MOD
2	GB/T	Additive	01.040	J04	TC562	2017-12-29		

No.	Code	Name	ICS	CCS	TC	Date issued	Adoption	Adoption type
	35351-2017	manufacturing— Terminology	.25					
3	GB/T 35352-2017	Additive manufacturing—File format	35.240.50	J04	TC562	2017-12-29	ISO/ASTM 52915:2016	IDT
4	GB/T 35022-2018	Additive manufacturing— Main characteristics and corresponding test methods—Parts and powder materials	25.030	J04	TC562	2018-05-14		
5	GB/T 34508-2017	Additive manufacturing with TC4 alloys powder by bed electron beam melting	77.160	H72	TC243	2017-10-14		
6	GB/T 14896.7-2015	Non-traditional machines— Terminology—Part 7: Additive manufacturing machines	01.040.25.080.99	J59	TC161	2015-12-10		

2. Technical Committee

- 1) The National Technical Committee on Additive Manufacturing (TC562) was established on March 30, 2016, with the approval of the National Standards Committee. The Secretariat is undertaken by the Intermediate Machine Productivity Promotion Center. It is mainly responsible for the formulation and revision of national standards in terms and definitions, process methods, testing methods, quality evaluation, software systems and related technical services. The Technical Committee for Additional Materials Manufacturing of the International Organization for Standardization (ISO/TC261) is responsible for daily management and business guidance by the China Machinery Industry Federation.
- 2) The National Technical Committee on Nonferrous Metals (TC243) is established by China Nonferrous Metals Industry Association and is responsible for the

standardization of nonferrous metal mines, smelting products, processed products and auxiliary materials. The Secretariat of the Technical Committee for Supplementary Manufacturing of the International Organization for Standardization (ISO/TC 79) is undertaken by the Institute of Metrology and Quality of Standards for Nonferrous Metals Industry of China.

- 3) The National Technical Committee on Non-Traditional Machine Tools (TC161) is prepared by China Machinery Industry Federation and is responsible for the standardization of special machine tools and other professional fields.

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