International Organization for Standardization
Organisation internationale de normalisation
Международная организация по стандартизации

STRATEGIC BUSINESS PLAN – ISO/TC 206

Executive summary

The term "Fine Ceramics" is the same as "Advanced Ceramics" or "Advanced Technical Ceramics", and is defined as "a highly engineered, high performance, predominantly nonmetallic, inorganic material having specific functional attributes". This definition describes a diverse range of materials, parts and products usually distinguished by their primary physical applications, such as mechanical, thermal and electrical.

World demand for fine ceramics is projected to expand to $ 71.7 billion in the year 2024. World demand for fine ceramics will be supported mainly by countries in the Asia-Pacific area, the US and Europe. These countries have the required industries and infrastructures to provide a strong market for products made of fine ceramics. In terms of market share, electronic ceramics constitute around half of the market.

For the fine ceramics industry to make a substantial contribution to the 21st century new materials industry, overcoming the following issues is imperative:
- further promotion of research and development in terms of the material itself, development of new uses and application technologies;
- research on manufacturing processes and cost-reduction through corporate efforts;
- establishment of testing and evaluation methods and standardization of the methods to prepare a basis for research and development, application and utilization; and
- promotion of international cooperation in the fields of research and development, and standardization;
- development of teaching on these materials and their applications.

The major objective of the works in the technical committee is focused on the harmonization and improvement of existing National and Regional Standards at first, since these standards have been developed in accordance with market needs in the countries and regions. According to the increasing necessity of fine ceramics as a key material of IT, telecommunication technology, countermeasures for global environment problem and energy crisis, the elaboration of International Standards for fine ceramics, especially on testing and evaluation methods and also the development of vocabulary or notations and symbols standards that contribute to a common language, is the main objective of ISO/TC 206. It is for accelerating global R&D activities in advance and for expanding market trading in time.

1 Introduction

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with expressed business environment needs and trends to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: ISO (International Organization for Standardization) is responsible for all sectors excluding Electrotechnical, which is the responsibility of IEC (International Electrotechnical Committee), and most of the Telecommunications Technologies, which are largely the responsibility of ITU (International Telecommunication Union).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of some 164 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.
The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO products represent lower levels of consensus and don’t have therefore the same status as an International Standard.

ISO offers also the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and therefore it is not accorded the status of an International Standard.

2 Business Environment of the ISO/TC 206

2.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal and social dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC, and they may significantly influence how the relevant standards development processes are conducted and the contents of the resulting standards:

The term "Fine Ceramics" is the same as "Advanced Ceramics" or "Advanced Technical Ceramics", and is defined as "a highly engineered, high performance, predominantly nonmetallic, inorganic material having specific functional attributes". This definition describes a diverse range of materials, parts and products usually distinguished by their primary physical applications, such as mechanical, thermal and electrical.
The terminology of "fine ceramics", first used in Japan, was derived from the characteristic texture of new type ceramics made of extremely pure and ultra-minute particles. "Fine ceramics" is classified into two categories: functional and structural ceramics. The research and development of fine ceramics that exploited its electric and magnetic features were stepped up in the 1930s when its electromagnetic features were first learned. Since the 1950s, uses of these functional ceramics have grown as an ingredient for spark-plugs, capacitors, integrated circuit packages, various sensors and others along with the growth of the electronics, machinery and telecommunications industries. In the 1970s, a specific family of advanced ceramics appeared: Fiber Reinforced Ceramic Matrix Composites, mainly used for high temperature aerospace and nuclear applications. In the 2000s, semiconductors and related coating technologies were developed due to the development of IT and communication technologies, and recently, fine ceramics have been attracting attention as a key material for fuel cells, photocatalysts, etc. in response to climate action and net zero transition.

The development of fine ceramics as a structural use, with the purpose of exploiting its features such as resistance against heat, wearing-out and corrosion, is said to have started when the United States developed "cermet". The country needed to develop a substitute for high temperature alloys due to difficulties in securing enough amounts of rare metals in the midst of the Cold War after World War II. The research and development of structural ceramics became full-scale after the 1972 Oil Crisis, in order to target improved heat efficiency through excellent heat resistance of fine ceramics - better than metals - and subsequently, energy saving effects. Full-scale developments were launched on the structural materials for use in heat and wear resistance products such as automobile parts, bearings and others. Table 1 presents a classification list for applications of fine ceramics with typical products. The unified classification system was originally developed in meetings of the Versailles Project on Advanced Materials and Standards (VAMAS) and Technical Working Area (TWA) 14. The achievements were published as the ISO/TTA 1 in 1994, and it was published as ISO 15165 from ISO/TC 206 in 2001.

Table 1 - Application of Fine Ceramic Materials and Components

Classification of application types	Typical products
Passive electrical application	
Power insulators	Spark-plug, Igniter, Grow-plug
Insulators for electronics	Substrates, Heat sinks
Microwave insulators	Windows, Phase shifters
Active electrical application	
Ohmic electrical conductors	Heating element, Electrodes
Ionic conductors	Gas detectors, Oxygen sensors

Capacitor applications	Multilayer chip capacitors
Non-ohmic electrical conductors	Varistors, Thermistors
Piezoelectric applications	Force and pressure transducers
Mechanical application	
Milling and crushing machinery	Mill lining, Milling media
Agricultural applications	Pulverizing nozzles
Wear-resistant facing for plant and machinery	Mould and die liners, Nozzles
Ballistic applications	Ballistic armor, projectiles
Material-cutting applications	Paper-cutting, Domestic knives
Material-shaping applications	Extrusion and drawing dies
Pump applications	Vanes and impellers, Shafts
Vane and tap (faucet) applications	Tap valves for water
Guides for thread, paper, tape, etc.	Thread-spinning nozzles
Bearing applications	- Precision bearings for aero applications and Machine tool applications - Electrical machines for electrical insulation purposes - Automotive applications for high performance and light weight, high speed, high accelerations (e.g. racing/ Formula 1)
Precision jigs and metrological devices	Sizing rings, Gauge blocks
Sports goods	Fishing-rod ring liners
Thermal and thermomechanical application	
Temperature-resistant electrical applications	Thermocouple insulators
High-temperature materials processing applications	Muffle tubes for furnaces
Aerospace applications	Rocket nozzles, Disk brakes – thermal protection systems – Airplane engine components
Heavy industry	Hot gas piping, Gas injectors
Domestic applications	Cooker tops, Cookware
Reciprocating engine applications	Turbocharger rotors
Applications in turbine engines	Rotors, blades and stators
Nuclear application	Nuclear fuel elements
Optical application	
Reflective applications	Telescope mirrors
Non-optical structure components for optical systems	Ferrules for fiber optics
Laser components	Laser waveguides, rods
Optical window applications	Optical & infrared wavelengths
Lamp envelopes	High-power lamp envelopes
Active optical components	Optical modulators
Chemical and biomedical applications	
Laboratory chemical equipment	Crucibles and boats, Funnels
Chemical paint applications	Vessels and pipes, ball valves
Chemical moulding parts	Rubber dipping formers
Filter bodies and materials	Ceramic filter membranes
Catalysts and catalyst supports	Catalysts, Catalyst supports
Biomedical applications	Dental implants
Magnetic applications	Components for transducers

2.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment to provide adequate information to support the actions of the ISO/TC:

The global market for fine ceramics (Advanced Ceramics, Advanced Technical Ceramics) is hard to estimate, but the attached data shows an expected outline.

Reference: Advanced Ceramics, A Global Strategic Business Report, MCP-1001, Global Industry Analysts, Inc., August 2023

Table 2-1 Trends of market size on fine (advanced) ceramics (unit: million US $)

Segments	2022	2023	2024	2025	2026	2027	2028	2029	2030
Advanced Ceramics	65,662.1	68,551.9	71,756.3	75,327.4	79,269.8	83,080.0	86,813.7	90,452.8	93,980.2
Segments	2022	2023	2024	2025	2026	2027	2028	2029	2030
Monolithic Ceramics	50,730.8	52,869.1	55,239.9	57,871.8	60,769.2	63,557.5	66,281.3	68,927.7	71,489.7
Coatings	9,582.8	10,029.7	10,526.4	11,084.8	11,698.0	12,293.7	12,880.3	13,454.4	14,008.8
Matrix Composites	5,348.5	5,653.1	5,990.0	6,370.8	6,802.6	7,228.8	7,652.1	8,070.7	8,481.7
Segments	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electrical & Electronics	36,129.1	37,622.6	39,278.3	41,119.2	43,141.1	45,087.2	46,988.1	48,834.4	50,618.2
Transportation	8,763.0	9,172.0	9,625.5	10,134.5	10,695.1	11,239.1	11,773.2	12,295.5	12,802.3
Machinery	5,738.6	5,958.0	6,196.7	6,460.7	6,752.4	7,034.6	7,309.6	7,575.5	7,832.1
Medical	6,510.5	6,862.5	7,255.7	7,696.5	8,186.8	8,663.4	9,134.4	9,598.2	10,051.5
Other End-Uses	8,520.9	8,936.8	9,400.1	9,916.5	10,494.4	11,055.7	11,608.4	12,149.2	12,676.1

Table 2-2 Trends of market size on fine (advanced) ceramics by areas

Region	2022	2023	2024	2025	2026	2027	2028	2029	2030
USA	14,864.3	15,467.1	16,130.3	16,862.1	17,668.6	18,443.9	19,199.5	19,931.9	20,638.6
CANADA	2,013.3	2,089.5	2,173.3	2,265.7	2,366.6	2,463.2	2,556.5	2,647.1	2,734.1
JAPAN	5,130.5	5,295.7	5,481.1	5,683.8	5,901.9	6,109.6	6,312.6	6,507.8	6,692.8
CHINA	19,651.7	20,698.8	21,851.9	23,149.3	24,598.4	26,014.3	27,410.5	28,779.7	30,118.1
EUROPE	12,730.7	13,178.1	13,689.2	14,257.3	14,864.3	15,439.9	15,998.0	16,536.7	17,054.1
ASIA-PACIFIC	7,766.1	8,164.2	8,603.1	9,094.4	9,648.7	10,189.6	10,723.4	11,247.7	11,758.3
LATIN AMERICA	1,362.0	1,424.2	1,492.5	1,568.5	1,652.6	1,733.9	1,813.7	1,891.6	1,967.1
REST OF WORLD	2,143.5	2,234.3	2,334.9	2,446.3	2,568.7	2,685.6	2,799.5	2,910.3	3,017.1
TOTAL	65,662.1	68,551.9	71,756.3	75,327.4	79,269.8	83,080.0	86,813.7	90,452.8	93,980.2

3 Benefits expected from the work of the ISO/TC 206

As a consequence of the development of harmonized International Standards, customers of issued and future standards developed by the ISO/TC 206 may be able to utilize common data with each other. This will result in the promotion of technological developments not only in the field of research and development of fine ceramic materials and processing, but also in the field of applications of these materials to develop fine ceramics components and products. Another benefit is the elimination of technical barriers to trade (WTO TBT Agreement).

For the fine ceramics industry to make a substantial contribution to the 21st century as a new materials industry, overcoming the following issues is imperative:
- further promotion of research and development in terms of the material itself, development of new uses and application technologies;
- research on manufacturing processes and cost-reduction through corporate efforts;
- establishment of testing and evaluation methods and standardization of the methods to prepare a basis for research and development, application and utilization; and
- promotion of international cooperation in the fields of research and development, and standardization.

New fine ceramic materials require a long period to establish their reliability for practical applications. Therefore, global collaboration on standardization at the early stage of technology innovation (early-stage standardization), proposed by the ISO/IEC Presidents' Advisory Board on Technological Trends (ABTT), is very attractive to provide useful standards for fine ceramics. In accordance with the market trends for fine ceramic components, standardization activities in the field of fine ceramics started in Japan (JISC), the US (ASTM Committee C-28), and Europe (CEN/TC 184). It may be noted that the priorities (market needs) of work items between each country are not always the same, however, a significant number of work items may appear to be a common interest (global market needs). We shall pay attention to the new proposals from the participating countries about their availability and usefulness.

4 Representation and participation in the ISO/TC 206

4.1 Membership

Explained on ISO website for ISO/TC 206:

https://www.iso.org/committee/54756.html

4.2 Analysis of the participation

ISO/TC 206 has 14 P (participating) – members and 22 O (observer) – members. As fine ceramics is a kind of new materials, many subjects under this TC are still in research and development stage.

Liaisons are also listed on ISO website for ISO/TC 206:

https://www.iso.org/committee/54756.html

5 Objectives of the ISO/TC and strategies for their achievement

5.1 Defined objectives of the ISO/TC 206

Elaboration of standards on fine ceramics (advanced ceramics, advanced technical ceramics) involves adjusting the work programme to meet market needs and working on appropriate projects. The major objective of the works in the technical committee is focused on the harmonization and improvement of existing National and Regional Standards at first, since these standards have been developed in accordance with market needs in the countries and regions. We have many proposals on the applications in various fields, so it is important to accept such proposals.
According to the increasing necessity of fine ceramics as a key material of IT, telecommunication technology, countermeasures for global environment problems and energy crisis, elaboration of International Standards for fine ceramics, especially on testing and evaluation methods, is the main objective of ISO/TC 206. It is for accelerating global R&D activities in advance and for expanding market trading in time.

5.2 Identified strategies to achieve the ISO/TC 206's defined objectives

The most importance is to provide suitable international standardization activities according to the global trend of fine ceramics market. The main efforts of ISO/TC 206 have been concentrated on the standardization of materials characterization and test methods on fine ceramics in the early stage of research and development as required from the market. For developing market-oriented activities, the participants in the technical committee activities are composed of main members from corresponding industries, and experts from the academy and national laboratories.

As various new proposals are received from P-members, it is important to evaluate the contents of the proposals appropriately, discuss the contents, add the necessary modifications, and proceed to the publication of useful international standards.

6 Factors affecting completion and implementation of the ISO/TC work programme

The technical committee has experienced problems that some of the P-members have difficulty finding financial support to attend the Plenary and Working Group meetings.
Consequently, most of the discussions in the Working Group are carried out by correspondence via e-mail and network-based communications.

Since the beginning of establishment of ISO/TC 206, technical cooperation with CEN/TC 184 has been continued under the Vienna Agreement including cooperation by correspondence, cooperation through mutual representation at meetings.

It should be notified that the relation between the experts and the national standard body depends on every country. We shall pay attention that the handling of proposals also depends on the country, on their handling every country.

7 Structure, current projects and publications of the ISO/TC 206

The structure, current projects and publications are summarized in ISO/TC 206 status report. The latest version is ISO/TC 206/N2617 (Dated 2023-11-02).

Information on ISO online

The link below is to the TC's page on ISO's website:

https://www.iso.org/committee/54756.html

Click on the tabs and links on this page to find the following information:
• About (Secretariat, Committee Manager, Chair, Date of creation, Scope, etc.)
• Work programme (published standards and standards under development)
• Membership
• Liaisons
• Structure (Subcommittees and working groups)
• Contact details

Reference information

ISO - Resources

ISO - Governance of technical work