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SETTING THE STANDARDS: HOW STANDARDS ENHANCE QUALITY AND PROMOTE RELIABILITY

JAPAN FINE CERAMICS ASSOCIATION AND ITS INTERNATIONAL STANDARDIZATION ACTIVITIES FOR FINE CERAMICS

A SHORT LIST OF STANDARDS-DEVELOPING ORGANIZATIONS

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INDUSTRY NEWS

ENPRO AGREES TO BUY OPTICAL FILTER AND COATINGS MAKER

Charlotte, N.C.-based EnPro Industries, Inc. agreed to acquire Alluxa, Inc., a privately held, Santa Rosa, Calif.-based company. Alluxa is an industrial technology firm that provides optical filters and thin-film coatings for applications in the industrial technology, life sciences, and semiconductor markets. EnPro is financing the transaction with cash and rollover equity from Alluxa executives. The purchase price is $255 million, including rollover equity. EnPro says it has a strategy to grow by acquisition in attractive markets.

North Carolina-based EnPro employs about 6,000 people.

The latest transaction follows two agreements Total signed in February to develop nearly two gigawatts of solar projects in Spain.

TOTAL AGREES TO BUILD SOLAR PROJECTS IN SPAIN

French energy company Total SE reached an agreement with Spanish developer Ignis to build 3.3 gigawatts of solar projects in Spain. The first projects are scheduled to start in 2022, with the rest expected to be in production by 2025. The transaction will bring Total's portfolio of solar projects under development in Spain to more than five gigawatts by 2025, contributing to Spain's goal of generating 70% of its electricity from renewables by 2030 and 100% by the middle of the century.

ALTONA ENERGY ACQUIRES MAJORITY STAKE IN RARE EARTH PROJECT

Australia-based Altona Energy, a mining exploration company with a focus on rare earth element projects in Africa, signed an agreement with Leadway Group Ltd. to acquire a 70% interest in a greenfield project in Uganda, the Nankoma Rare Earth Project. Altona says it wants to build a portfolio of rare-earth sites in Eastern and Central Africa. When the agreement is final, Altona will be responsible for completing a feasibility study on establishing a commercial-scale, rare-earth mining and processing operation at the site. Altona will also be the manager and operator of the project.

The Nankoma Rare Earth Project is located in Eastern Uganda.

SIEMENS, UNIVERSITY OF NEW MEXICO COLLABORATE ON RENEWABLE ENERGY

Siemens Industry and the University of New Mexico signed an agreement to collaborate on integrating renewable energy systems and microgrids. The agreement is centered around a University-owned microgrid. The microgrid assets include facilities such as a cooling tower, thermal storage tank, battery energy storage system, fuel cell, photovoltaic system, and a natural gas generator. The university is part of a statewide consortium that received a five-year, $20 million grant in 2018 to modernize the electrical grid. Its microgrid facilitates research into power system modernization, renewable energy systems, smart grids, and smart cities.


The university's microgrid was built partly to test new smart-grid technologies.

MORE INDUSTRY NEWS

BERLIN PACKAGING ACQUIRES NETHERLANDS-BASED COMPANY

Berlin Packaging announced the acquisition of Vinkova B.V., a Netherlands-based glass packaging supplier with expertise in the food and beverage sectors. The transaction is Berlin's eighth acquisition in Europe since 2016. "Continued expansion in Europe is a central tenant of Berlin Packaging's overall growth strategy," says Bill Hayes, CEO and president of the Chicago-based company. The company says all Vinkova employees and locations would be retained. Financial details were not disclosed.

Berlin Packaging maintains more than 130 sales and warehouse locations, and design and innovation centers on two continents.

SANDVIK JOINS GE ADDITIVE BETA PROGRAM

GE Additive announced that Sandvik Additive Manufacturing joined its Binder Jet beta partner program. Sandvik has a broad alloy program for additive manufacturing on the market, marketed under the Osprey brand. The GE program uses its industrialized additive technology with technical partners to grow its Binder Jet technology. GE says the first phase involves developing the beta system into pilot lines, and eventually into a commercially available factory solution in 2021.

Sandvik is a Stockholm, Sweden-based company with about 40,000 employees.

GUARDIAN GLASS COMPLETES STARTUP OF PLANT IN POLAND

Guardian Glass completed starting up its second float glass facility in Częstochowa, Poland, to help meet the demand for high-performance coated and fabricated glass products in Eastern Europe. The plant hosts two float lines, two coater lines, and a lamination line. Headquartered in Auburn Hills, Mich., Guardian Glass has six float glass plants in the United States and one in Mexico, as well as many fabrication facilities and warehouses. Guardian Glass companies also operate ten float glass plants across Europe and Russia.

The Częstochowa plant represents Guardian's biggest greenfield capital investment in its history, the company says.

The Made In Space ceramics manufacturing module team.

CERAMIC MANUFACTURING MODULE HEADED TO SPACE STATION

Made In Space plans to launch a ceramic manufacturing module to the International Space Station. The technology is a commercial, in-space manufacturing device designed to provide proof-of-potential for single-piece, ceramic turbine blisk (blade and disk) manufacturing in microgravity for terrestrial use. This project marks the first ceramic facility on the ISS. Made in Space says the module will demonstrate the viability of manufacturing with preceramic resins in an additive, stereolithography environment. Made In Space is developing the technology with technical partners HRL Laboratories of Malibu, Calif., and Sierra Turbines of San Jose, Calif.

SETTING THE STANDARDS: HOW STANDARDS ENHANCE QUALITY AND PROMOTE RELIABILITY

By David Holthaus

Standards in manufacturing are essential to ensuring quality products and to improving the accuracy and reliability of the materials used to make them.

They are also critical to promoting the safety of those who use the products, and sometimes it can literally be a matter of life and death.

In 2018, after two years of work, a committee of ASTM International, one of the world's largest standards-developing organizations, published requirements for bullet-resistant doors on police vehicles.

The standard called for door panels to be made from a combination of ceramic and fabric, with the ceramic material acting as the strike face to break bullets that were made with steel cores. Such ammunition was increasingly being used in the high-powered weaponry that police were encountering on the streets, according to ASTM. Panels made with basic, armored steel often would not stop bullets with steel cores.

The new specification standardized protection levels and included language to help public safety agencies retrofit their vehicles or buy new ones with the safer ceramic-fabric panels.


ASTM International's headquarters in West Conshohocken, Pa.
Credit: ASTM International

It was a dramatic example of how standards evolve to keep up with new technology, materials, and processes.

Perhaps not as dramatic, but equally important in terms of safety and reliability, is the development and evolution of standards used to make refractories, the materials used to build structures routinely subjected to high temperatures.

The ASTM International Committee C08 on Refractories was founded in 1914. Over its history, the committee has defined what a refractory is, classified them by type and function, and defined tests to determine their suitability for specific applications.

In the early decades of the committee's existence, refractories were used to build the linings of fireplaces, kilns, and stills, among other applications. By the end of the 20th century, refractories were used to line nuclear reactors and in the manufacturing of reentry heat shields for space shuttles.

The new uses demanded standardized tests to benchmark performance and to help evaluate and develop new materials.


Standards for the production of refractories have evolved since 1914. *Credit: RHI Magnesita*

Bill Headrick has been involved with creating and refining ASTM standards for more than 30 years, and he is currently working with Committee C08 as the chair of the technical subcommittee on monolithics.

Headrick is head of research and development for aluminosilicate products for the Americas at RHI Magnesita, the world's largest refractories company.

There are more than 100 standards relating to refractories alone, and the manual on refractory standards is nearly an inch thick, Headrick says. Committee members are engaged in a continuous process of evaluating and reviewing the standards to make sure they are up to date. In August alone, Headrick says the committee reevaluated six standards.

"The biggest thing is making sure we're using the best available methods," he adds.

For example, for years, the only method for determining the chemistry of materials was wet chemistry, and the relevant standards only addressed those methods. "Now, we have X-ray fluorescence, X-ray diffraction, mass spectroscopy, and we've had to rewrite our standards to take into account these better methods that give better results," he says.

The committee is currently doing a lot of work to make standards safer, Headrick says, and to have them align with the health and safety requirements of employers.


Bill Headrick
RHI Magnesita

Some of the standards for measuring chemistry use materials that are considered hazardous to health, leading the committee to look for alternative materials that are safer and can produce similar results.

"That's the biggest evolution going on," he says. "We're going through all the standards and making sure they're as safe as possible."

It is a deliberative process.

Every five years, ASTM standards must be reviewed and reapproved by the appropriate subcommittee and then by the main committee. Any negative comment about the proposed standard must be resolved before the standard can be approved.

"To pass a standard, you have to eliminate every single negative," Headrick says. "Once everyone is in full, 100 percent agreement, then the standard is published. That can take a matter of months to a number of years."

For several years now, ASTM committees and subcommittees have worked on the standardization of the growing and developing field of additive manufacturing, the process of fabricating parts and components layer by layer using computer-aided design rather than traditional manufacturing methods.

Improved technology, advanced equipment and sensors, and more suitable materials are driving the productivity and reliability of additive manufacturing production, yet the rapid change has pointed up the need for standardization, says Mohsen Seifi.

Seifi is ASTM's director of global additive manufacturing programs, responsible for additive manufacturing programs that support standards development and other products and services at the organization. He also oversees its Additive Manufacturing Center of Excellence, which has the mission to bridge the gap between standardization to research and development.

By 2008, the nascent additive manufacturing industry had reached the point where standards were needed.

"Without standards, it's going to be the Wild West," Seifi says. "Industry needs standards for rapid implementation of this technology for critical applications."

Standards are constantly reviewed to keep up to date with advances in technology, with two examples being the use of refractories in space shuttles and in the linings of nuclear reactors. *Credit: (top) NASA; (bottom) Duke Energy*

Additive manufacturing's shortened development cycle and more efficient process means products can be designed and produced more quickly, but standardization is necessary to create consistency and reliability, and to serve as a foundation for continued growth.

"Innovation is inevitable, but without having standards in place, you can't really drive this technology forward in terms of full implementation and adoption to satisfy regulation," Seifi says.

"The reason is very clear," he adds. "You need to make sure we're all communicating the same language and making products in a repeatable and reliable fashion."

Mohsen Seifi,
ASTM International

ASTM's committee on additive manufacturing technologies has met since 2009 and now has more than a thousand members from more than 35 countries who have developed standards that support the application and adoption of additive manufacturing for diverse materials and processes across various industry sectors.

In 2011, ASTM International and the International Organization for Standardization (ISO) signed an agreement paving the way to create joint additive manufacturing standards in order to increase collaboration and minimize duplication of efforts.

"If you are a user of this technology interested in fabricating parts and components, are you going to receive the same results if you produce a part at a service provider in the U.S. versus Europe versus Asia?" Seifi says. "That's where standards play a critical role to make sure we manufacture products in a consistent, reliable, and repeatable manner."

Another key reason for standards is to facilitate certification of additively manufactured parts from regulatory bodies such as the Federal Aviation Administration, NASA, Department of Defense, Food and Drug Administration, and many others.

"Once a standard is out, it has the potential to become part of regulatory frameworks and can get into federal codes and referred to in federal contracts," Seifi says.

One of the key trends on additive manufacturing standardization is understanding the challenges the technology brings in regard to data management and schema, Seifi says. The 3D printers and their sensors can generate gigabytes, sometimes terabytes, of data. "The question is, what data to collect according to what standard and format and why?" he says. "Is that data you collect findable, accessible, and reusable? Does it make sense to capture that data, and using what standard method? What kind of intelligence can we generate from the data to improve the process?"

"There are major standard gaps in this space that ASTM is trying to fill," he adds.

In the cases of newer technologies such as additive manufacturing, and older processes such as refractory production, standards have helped advance processes, improve quality, and enable those production methods to be used reliably in a growing range of industries and applications.

A short list of standards-developing organizations

There are many organizations in the U.S. and around the world that work to develop standards for their industries. Here are some that apply to manufacturing:

- **The Association for Manufacturing Technology**
  Based in McLean, Va., the association promotes the interests of American manufacturing machinery and equipment, including the standardization of technology used to run machines. www.amtonline.org

- **The American Nuclear Society**
  Based in LaGrange Park, Ill., the Society advances the development of nuclear science, engineering, and technology, and maintains a standards committee and board. www.ans.org

- **The American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)**
  Based in Atlanta, Ga., the Society focuses on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability through research, standards writing, publishing, and continuing education. www.ashrae.org

- **American Society of Mechanical Engineers**
  Based in New York City, N.Y., the Society enables collaboration and skills development across engineering disciplines through programs in continuing education, training and professional development, codes and standards, research, and conferences and publications. www.asme.org

- **ASTM International**
  Formerly known as American Society for Testing and Materials, ASTM International is an international standards organization that develops and publishes consensus technical standards for a range of materials, products, systems, and services. It is headquartered in West Conshohocken, Pa., outside of Philadelphia. www.astm.org

- **International Code Council**
  Based in Washington, D.C., the Council is an association of building safety professionals and a source of model codes and standards that establish baselines for building safety. www.iccsage.org

- **The International Organization for Standardization (ISO)**
  Headquartered in Geneva, Switzerland, ISO is an international standard-setting body composed of representatives from various national standards organizations. It promotes worldwide proprietary, industrial, and commercial standards. www.iso.org

- **The International Committee for Information Technology Standards (INCITS)**
  Based in Washington, D.C., this committee is a standards development organization composed of information technology developers. www.incits.org

- **The International Society of Automation**
  Based in Research Triangle Park, N.C., the Society is a technical society for engineers, technicians, businesspeople, educators, and students, and it sets standards for industry professionals in automation. www.isa.org

- **National Institute of Standards and Technology (NIST)**
  Headquartered in Gaithersburg, Md., NIST is a nonregulatory federal agency within the U.S. Department of Commerce that develops and disseminates standards that allow technology to work seamlessly and business to operate smoothly. www.nist.gov

- **NSF International**
  Based in Ann Arbor, Mich., NSF International has developed more than 80 public health and safety standards, and tests and certifies products to verify they meet those standards. www.nsf.org

- **SAE International**
  Previously known as the Society of Automotive Engineers, Warrendale, Pa.-based SAE International is a standards-developing organization for engineering professionals in various industries. Its principal emphasis is on global transport industries, such as aerospace, automotive, and commercial vehicles. www.sae.org

- **UL**
  Formerly known as Underwriters Laboratories, UL is a global safety certification company headquartered in Northbrook, Ill. It is approved to perform product safety testing by the U.S Occupational Safety and Health Administration. www.ul.com

JAPAN FINE CERAMICS ASSOCIATION AND ITS INTERNATIONAL STANDARDIZATION ACTIVITIES FOR FINE CERAMICS

By Hirofumi Takemura

Japan Fine Ceramics Association (JFCA) was established in 1986 with a mission to promote the development of the fine ceramics/advanced ceramics industry. To take advantage of the most advanced technologies of fine ceramics, overall collaboration of manufacturers, users, universities, and research laboratories is required, together with the fusion of other materials.

The members of JFCA are 104 companies from different industries, such as ceramics, chemicals, metals, automobiles, electronics, power supply, and service. Through various activities, JFCA brings together and promotes cooperation among government, industry, academia, and overseas countries for the further expansion of the fine ceramics industry. The United States Advanced Ceramics Association (USACA), European Ceramics Center (PEC), and Ceramics Application are cooperating members of JFCA.

There are technical committees and consortiums in JFCA. Committees operate research groups such as Solid Oxide Fuel Cells, Power Electronics, GaN, LED, Bioceramics, Optical Ceramics, Material Function Predictive Simulation, Advanced Coating Alliance, and Ceramics Matrix Composites Consortium. In September, Fine Ceramics Roadmap 2050 Study Group was launched, which will publish the latest Roadmap in both Japanese and English versions in December 2021.

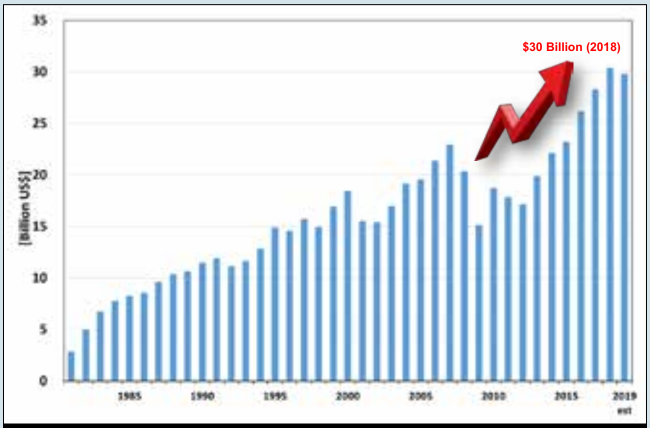


Figure 1. Fine ceramics production in Japan.
Credit: Japan Fine Ceramics Association

Figure 1 shows the amount of fine ceramics production in Japan, which reached $30 billion in 2018.[1]

The benefits of standards for worldwide industries are extensive.[2] Standards help manufacturers reduce costs, anticipate technical requirements, and increase productive and innovative efficiency. Standards make trade across international borders easier and promote global competition, having a positive impact on economies.

Standards provide consumers with confidence in the quality and safety of products and services. In a global economy of rapidly emerging new technologies and markets, standards help set the rules and establish the frameworks, making it easier to innovate successfully.

ISO international standards help businesses of any size and sector reduce costs, increase productivity, and access new markets. Standards can help to

- Build customer confidence that the products are safe and reliable;
- Meet regulation requirements, at a lower cost;
- Reduce costs across all aspects of a business;
- Gain market access across the world;
- Improve quality, safety, and lead time of products and services;
- Lower research and development costs and improve speed to market by building on previously standardized technology or systems; and
- Provide uniformity of units measurement, enabling accuracy and confidence in commercial transactions locally and globally.

THE ROLE OF JFCA

JFCA conducts surveys and research to promote the international standardization of fine ceramics. JFCA, as a drafting organization in the field of fine ceramics, is making international standards for high-quality, safe, secure, and highly reliable fine ceramic materials.

JFCA holds the secretariat of ISO/TC206 (Fine Ceramics) and ISO/TC150/SC7 (Tissue-engineered Medical Products) under the Japanese Industrial Standards Committee. In addition, as a national committee for ISO/TC206 and ISO/TC150 (Implants for Surgery) in Japan, we are engaged in deliberating proposals for new work items, development of projects in Japan and other countries, and maintenance and management of issued ISO standards.

ACCELERATION OF STANDARDIZATION SPEED

The speed of technological development increases to popularize new technologies globally. The conventional model shown in Figure 2, "Research & Development-Standard Development-Manufacturing / Products," cannot catch up with its speed.

It is necessary to proceed with R&D and standard development at the same time and connect it to global manufacturing.

As shown in Figure 3, loop-shaped parallel development becomes the most effective way to establish standardization.[3]

Figure 2. Conventional standardization model. *Credit: Japan Fine Ceramics Association*

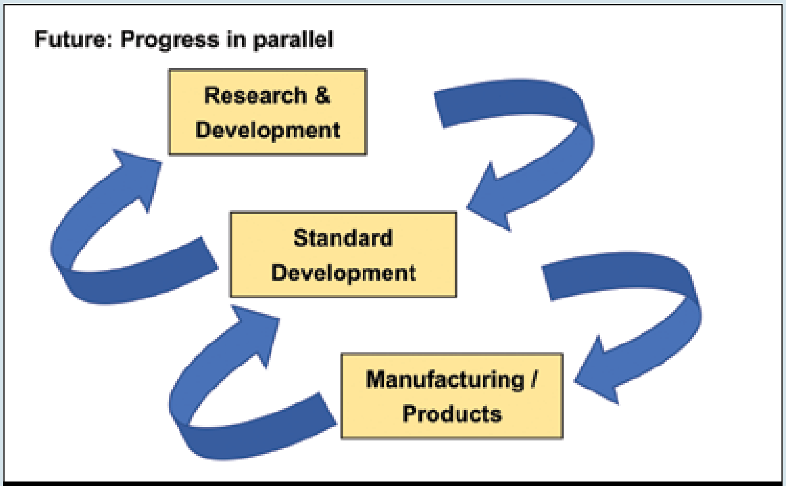


Figure 3. Future standardization model. *Credit: Japan Fine Ceramics Association*

ABOUT INTERNATIONAL STANDARDS ORGANIZATION

International standards are published by international standardization bodies; three organizations are the representative. International Organization for Standardization (ISO) establishes international standards in a wide range of fields, except the fields of electricity, electronics, and communications. International Electrotechnical Commission (IEC) establishes international standards in the fields of electricity and electronics, and International Telecommunication Union (ITU) establishes international standards in the fields of communication, broadcasting, and information technology.

ISO is currently divided into 333 technical committees that deliberate and manage international standardization. The international standards for fine ceramic materials mainly belong to two committees: ISO/TC206 (Fine Ceramics) and ISO/TC150 (Implants for Surgery).

ISO/TC206 standardizes various forms and functions of fine ceramics. Japan is the secretariat of this committee and has a committee manager. The chair is from South Korea. The ISO/TC206 scope states as follows[4]: Standardization in the field of fine ceramics materials and products in all forms: powders, monoliths, coatings and composites, intended for specific functional applications including mechanical, thermal, chemical, electrical, magnetic, optical, and combinations thereof. The term "fine ceramics" is defined as "a highly engineered, high performance, predominantly non-metallic, inorganic material having specific functional attributes."

Note: Alternative terms for fine ceramics are advanced ceramics, engineered ceramics, technical ceramics, or high-performance ceramics.

The ISO/TC206 strategic business plan has the following description[4]:

World demand for fine ceramics is projected to expand to $75 billion in the year 2020.

In order for the fine ceramics industry to further grow to contribute to the 21st century as a new materials industry, the following issues have to be overcome.

- 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.
- Promoting international cooperation in the fields of research and development, and standardization.

Table 1 shows the composition of ISO/TC206, the number of ISO registrations, and the number under development. ISO/TC206 is divided into more specialized working groups (WGs) from WG1 to WG12. Since the committee's inception in 1992, 136 standards have been issued. In recent years, about 10 new standards were published each year. In addition, there are 18 items under development.

WG	Title	Published Standards	Standards under development
WG1	Terminology/Classification	2	1
WG2	Powders	16	0
WG3	Chemical analysis	4	3
WG4	Composites	22	2
WG5	Porous ceramics	4	0
WG6	Monolithic ceramics/Mechanical properties	20	0
WG7	Monolithic ceramics/Physical and thermal properties	10	1
WG8	Joining	4	0
WG9	Photocatalysis	28	3
WG10	Coatings	16	2
WG11	Electrical and optical applications	6	3
WG12	Engineering applications	4	3
ISO/TC206		136	18

Table 1. ISO / TC206 structure, number of published standards and standards under development

SC/WG	Title	Published Standards	Standards under development
SC1	Materials	37	7
SC2	Cardiovascular implants and extracorporeal systems	33	11
SC4	Bone and joint replacements	36	5
SC5	Osteosynthesis and spinal devices	26	9
SC6	Active implants	16	2
SC7	Tissue-engineered medical products	4	0
WG1-15		14	5
ISO/TC150		166	39

Table 2. ISO/TC150 structure, number of published standards and standards under development

New work-item proposals are deliberated by experts in the relevant working groups depending on the technical field. After approval of new business-item proposals, deliberation and approval proceed by passing through the stages of working draft, committee draft, draft international standard, and final draft international standard, to the goal of being published. It takes about three years to complete the process.

ISO/TC206 is currently composed of Participating Members from 14 countries (nine countries in Europe; five countries in Asia) and Observer Members from 20 countries. Participating Members have the right to vote and can elect experts to actively participate in the proposed project.

ISO/TC206 holds a plenary meeting once a year where member countries can participate. This year, it was scheduled to be held in Brussels, Belgium, but due to the COVID-19 pandemic, the face-to-face conference was canceled, and a web conference was held by Japan. The plenary meeting is a valuable opportunity for experts on global standardization to gather once a year, but it was a shame it was canceled. It is scheduled to be held in France in 2021 and in Belgium in 2022. Japan took the role as host country in the first, tenth, and twentieth plenary meetings. 2023 will be the thirtieth meeting, and we would like to hold the meeting in Kyoto, Japan.

ISO/TC150 is a committee related to surgical implants. It includes bioceramics such as artificial bones and dental implants, which overlap with the field of fine ceramics. Germany is the chair of TC150, and Japan holds the secretariat of TC150/SC7.

The ISO/TC150 scope states as follows[5]:

Standardization in the field of implants for surgery and their required instrumentation, covering terminology, specifications, and methods of tests for all types of implants, and for the materials both basic and composite used in their manufacture and application.

The ISO/TC150 configuration is divided into specialized fields: subcommittee (SC) from SC1 to SC7, and working groups from WG1 to WG15. Since its inception in 1971, the technical committee has issued 166 standards, and 39 standards are under development.

ISO/TC150 currently consists of Participating Members from 29 countries, and Observer Members from 17 countries.

RECENT INTERNATIONAL STANDARDIZATION ACTIVITIES

New work-item proposals were made from Japan to ISO/TC206 in 2020. Two proposals were made regarding the thermal characteristics evaluation method for ceramic substrates for power modules, and one proposal was made regarding the evaluation method for power generation characteristics of piezoelectric materials. One new work-item proposal was approved for a ceramic substrate for a power module, and it is currently at working draft stage.

The market size of power modules was 420 billion yen in 2019, and it is projected to be 570 billion yen in 2025 (140% of 2019). The core technology for ensuring the long-term reliability of power modules is the high-temperature resistance of power semiconductors. More specifically, it is heat that controls the change over time, and the ambient temperature and heat generated by driving the element contribute as heat sources.

We have strategically promoted the world's first international standardization of the method for measuring the thermal properties of ceramic substrates for power electronics, which is a key element of next-generation power semiconductors.

In addition, JFCA is promoting a research project to develop international standardization of fine ceramics as a preliminary step to propose new work-item proposals to ISO. We are working on about six projects a year. Each project takes three years to research, prepare a standardization draft, and make a new proposal to ISO.

The following projects are underway as ongoing research and research projects.

- Test method for GaN crystal surface defects.
- Strength reliability test method for ceramic materials for solid oxide fuel cells (SOFC).
- Corrosion-resistant test method for fine ceramic thin films.
- Optical characteristic evaluation method for ceramic phosphors for white LEDs.
- Test method for thermal characteristics of insulating substrates for power electronics.
- Mechanical property test method for bioceramics.

All of these projects cover advanced technological fields where the market for fine ceramic materials is expected to expand, and they are developments for standardization related to property test methods for fine ceramic materials. We are aiming for international standardization to ensure high-quality, safe, secure, and highly reliable fine ceramic materials.

To secure the competitiveness of the fine ceramics industry and to develop the industry, it is necessary to differentiate products by improving functionality, strengthen price competitiveness by innovation in manufacturing processes, enhance product revolution by innovation of materials, develop new markets, and lead with speed. We hope that the international standardization promoted by JFCA will contribute to the further expansion of the fine ceramics industry.

OTHER JFCA ACTIVITIES

CMC International Cooperation: CMC International Cooperation was established in 2020 for developing reliability assurance technology for ceramic matrix composites. This consortium consists of the CMC center at Tokyo University of Technology, Ultra High Temperature Materials Research Center, and JFCA.

CMC International initiated development of the international standard inspection method that can overcome the problems of the conventional test method for ceramic matrix composite reliability. The method of guaranteeing reliability for use by taking advantage of the "damage tolerance" is not established yet. The first step is to prepare SiC/SiC test pieces that are damaged and defective inside. Then, we will conduct an evaluation test (round robin test) using common test pieces by overseas joint research partners of the University of Birmingham and the University of California, Los Angeles.

Giant Micro-photonics Research: The Giant Micro-photonics Project was established in 2020 by RIKEN Spring-8 Center (RSC), National Institute for Materials Science (NIMS), Mitsubishi Electric Co., Kounoshima Chemical, and JFCA to achieve dramatic sophistication of extremely high-power, solid-state lasers and terahertz generation by new transparent ceramic materials, or so called giant micro-photonics. Based on these research results, the project is expected to prototype and develop a compact ultrahigh output, power density laser and develop wavelength conversion technology, which was difficult until now. It is also designed to convert to other important wavelengths and apply laser driven particle accelerators.

Japan Ceramics Expo: JFCA is the coorganizer of Japan Ceramics Expo, which is one of the world's largest exhibitions alongside Ceramitec in Munich and Ceramics Expo in Cleveland, Ohio. Japan Ceramics Expo is organized by the Reed Exhibitions Japan and gathers all kinds of highly functional ceramics, materials, forming/processing equipment, burning/heating equipment, evaluation/testing/analysis equipment. It is held every year in Osaka and Tokyo.

Japan Ceramics Expo is chosen by advanced materials industry players worldwide as the best gateway to the Japanese and Asian markets. For more information, please go to

https://www.ceramics-japan.jp/en-gb.html.

Osaka Expo
Dates: Wednesday, June 23 to Friday, June 25, 2021
Venue: INTEX Osaka, Japan

Tokyo Expo
Dates: Wednesday, December 8 to Friday, December 10, 2021
Venue: Makuhari Messe, Japan

ABOUT THE AUTHOR

Hirofumi Takemura is director of Japan Fine Ceramics Association.

REFERENCES

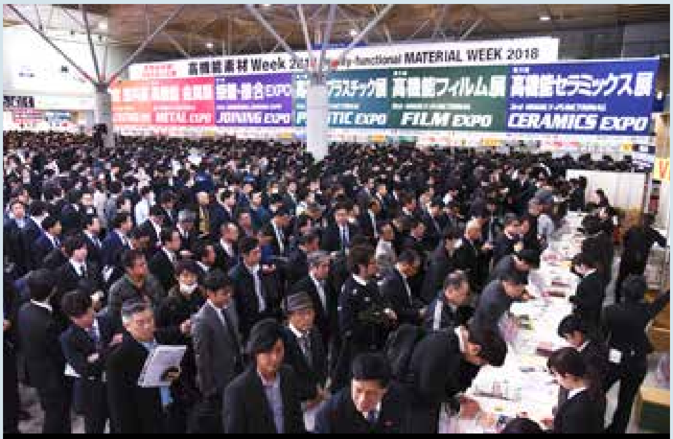
[1]JFCA Fine Ceramics Industrial Trend Survey (2019)

[2]ISO-Benefits of standards (https://www.iso.org/benefits-of-standards.html)

[3]METI Standardization Seminar (2020)

[4]ISO/TC206-Fine ceramics (https://www.iso.org/committee/54756.html)

[5]ISO/TC150-Implants for surgery (https://www.iso.org/committee/53058.html)



Japan Ceramics Expo in 2018. *Credit: Japan Fine Ceramics Association*

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