

Technical Committee on Metal and Ceramics

1. Objective

The Metals and Ceramics Technical Committee aims to contribute to the development of metal and ceramics technologies related to electricity, electronics, and optics, as well as applied technologies, through research and transmission of information on technologies related to metals and ceramics materials, as well as talent development.

For the aforementioned objectives, this Technical Committee, in addition to electrical and electronic functional materials, will address mechanical functional, thermally functional, optically functional, and chemically functional materials; processing technology and evaluation of these materials; and items related to their application.

2. Fields of activity

The Metals and Ceramics Technical Committee has been involved in the following activities:

- (1) Superconducting materials and devices using the following materials: Metal-based superconducting materials, high-temperature superconducting materials, wires and magnets, magnetic sensors, particle detectors, digital and analog circuits, and quantum computing devices.
- (2) Advanced semiconductors geared toward power electronics and device technologies using the following devices: SiC, diamonds, heat-resistant semiconductor devices, and high-frequency semiconductor devices.
- (3) Advanced functional materials and applied fundamental technologies: Nanoscale functional materials, e.g., carbon nanotubes
- (4) Energy conversion materials and devices using the following components: Photoelectric conversion elements, thermoelectric conversion elements, fuel cells, secondary cells and batteries, and piezoelectric elements.
- (5) Advanced conductive and resistive materials and basic technologies for their application: high-purity/high strength, high-conductivity/high-strength aluminum, and high strength silver.

3. Activity content

The Metals and Ceramics Technical Committee is currently conducting the following activities:

- (1) Technical committee meetings

The technical committee meets four times a year to plan and manage activities in the metal ceramics field, thereby promoting development in this field. In addition, it actively promotes cooperation with other technical committees, e.g., "Society B Superconducting Equipment Technical Committee."

- (2) Organize and operate investigation committees

The Low-Temperature Electronics Based on Phase Engineering Investigation Committee was in operation from 2013 to 2016 and investigated new electronic devices based on superconducting phase control. The results were summarized in the special edition "Recent Progress in Superconducting Electronics Based on Phase Engineering" (December 2016 edition). In addition, in 2019, the Use of Low-Temperature Digital Circuits as the Quantum Computer Peripheral Circuits Investigation

Committee was established, and it commenced investigations to determine the possibility of using low-temperature digital circuits suitable for extremely-low-temperature mounting, which is an issue encountered with extremely low-temperature quantum computers. The investigation results are scheduled to be summarized in the special edition "Present Status of and Problems in Superconductor and Semiconductor Quantum Computer Development" (April 2022 edition). The establishment of an investigation committee with regard to the application of informatics to create superconductive materials is being explored as a new theme.

(3) Technical Meeting activities

Youth-focused seminars on metal ceramics are organized every year to promote research announcements and exchanges among younger researchers. In addition, a Technical Meeting on superconducting equipment sponsored by "Society B Superconducting Equipment Technical Committee" is held.

(4) Planning of symposiums at national conventions

At the 2018 IEEJ National Convention, a symposium, "Quantum-pioneered next-generation computing," was convened to disseminate the status of research and development on quantum computing and quantum information processing, which has recently been attracting attention. The 2022 IEEJ National Convention is planning a symposium under the title "The forefront of hydrogen technology for realizing carbon neutrality."

(5) Tours

This technical committee conduct tours and, thus far, has organized tours of the Railway Research Institute (2018), the Furukawa Electric Yokohama Research Center (2017), and the Furukawa Electric Nikko Works (2016).

4. Committee members

Position	Name	Affiliation
Chairperson	Nobuyuki Yoshikawa	Yokohama National University
Primary member	Akira Fujimaki	Nagoya University
"	Atsushi Unemoto	Tokyo Gas Co., Ltd.
"	Satoru Kuboya	Toshiba Corporation
"	Junichi Shimoyama	Aoyama Gakuin University
"	Mutsuo Hidaka	National Institute of Advanced Industrial Science and Technology
"	Katsutoshi Mizuno	Railway Technical Research Institute
"	Akiyasu Yamamoto	Tokyo University of Agriculture and Technology
Secondary member	Mutsuo Hidaka	National Institute of Advanced Industrial Science and Technology
Secretary	Nobuya Banno	National Institute for Materials Science
Assistant secretary	Ataru Ichinose	Central Research Institute of Electric Power Industry

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