

South Korea, Member of ICHMT, AIHTC, AUTSE (2)

1. International Activities of Thermal Engineering Societies in Korea

Bong Jae Lee and Ji Hwan Jeong

2. Report on Thermal Engineering Conference (Spring 2022)

Hyunjin Lee and Bong Jae Lee

1. International Activities of Thermal Engineering Societies in Korea



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Most Korean scientists and engineers in heat and mass transfer belong to the Thermal Engineering Division of the Korean Society of Mechanical Engineers (KSME), Division of Nuclear Thermal Hydraulics of the Korean Nuclear Society (KNS), Society of Air-conditioning and Refrigerating Engineers of Korea (SAREK). The following are the past and future international conferences at which the aforementioned societies take leadership roles.

Internal Symposium on Oscillating & Pulsating Heat Pipe (ISOPHP), September 2019, KAIST, Korea

- Symposium consisted of 4 keynote lectures, 7 oral sessions, and 1 poster session.
- There was a panel discussion titled "Status of PHP Applications in Industry" organized by Prof. J. Thome.

13th International Energy Agency Heat Pump Conference (HPC2020), April 2021, Jeju, Korea

- There were 3 plenary lectures, 36 keynote lectures, 36 oral sessions, and 4 poster tracks.

27th IIR International Congress of Refrigeration (ICR2027), August 2027, Seoul, Korea

- Conference chair: Prof. Yong Tae Kang (SAREK President)
- Congress program will provide plenary sessions, short courses, panel and forum sessions, technical seminars for industrial sponsors, technical excursions, and general tours for accompanying persons as well as IIR meetings, reception, banquet, etc. during 5 days.

9th Korea-China Workshop on Nuclear Reactor Thermal-Hydraulics (WORTH-9), May, 2019, Chongqing, China

- Co-organizing of the conference
- Conference co-chair: Dr. Chul Hwa Song (Korea Atomic Energy Research Institute)
- There were 2 plenary lectures, 8 keynote lectures, 15 oral sessions, 6 post sessions and 100 participants.

11th Symposium Japan-Korea Symposium on Nuclear Thermal Hydraulics and Safety (NTHAS-11), November 2018, Busan, Korea

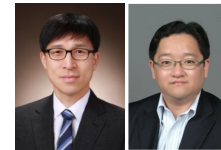
- Biennial international joint workshop between Korean and Japanese nuclear energy societies
- Conference chair: Dr. Young Seok Bang (Korea Institute of Nuclear Safety)
- There were 4 plenary lectures, 6 keynote lectures, 24 oral sessions, and 200 participants.

12th Symposium Japan-Korea Symposium on Nuclear Thermal Hydraulics and Safety (NTHAS-12), October 30-November 2, 2022, Miyazaki, Japan

- Co-organizing of the conference
- Conference co-chair: Prof. Jae Jun Jeong (Pusan National University)
- Conference program will provide plenary sessions, keynote lectures and technical sessions.

2. Report on Thermal Engineering Conference (Spring 2022)

April 20 – 22, 2022 in Gyeongju-si



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The Thermal & Fluid Engineering Division of KSME was established in 1980, and the first Thermal & Fluid Engineering conference was held in 1993. In 1998, the Thermal Engineering Division (TED) was separated, and the Thermal Engineering Conference has been independently held ever since. This year, KSME TED was able to organize a fully in-person conference from April 20–22 in Gyeongju-si, Korea. There were 535 attendees and 292 presentations (205 Oral and 87 Poster) about all areas of heat and mass transfer (see Fig. 2 below).

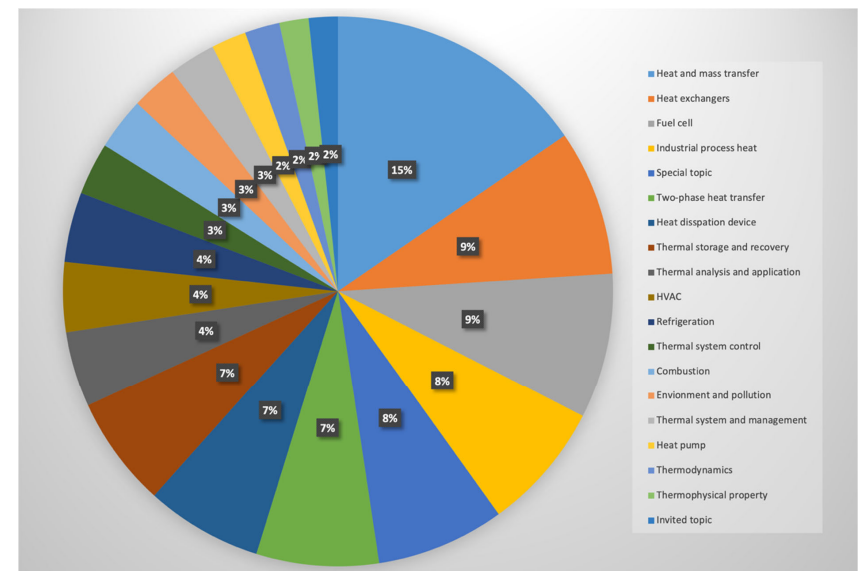


Fig. 2 Sessions (total 292 presentations)

South Korea, Member of ICHMT, AIHTC, AUTSE (3)

- 1. Report on the Korean Society of Mechanical Engineering (KSME) Annual Meeting 2022**
Wonyoung Lee and Taesung Kim
- 2. Special Topics in Journal of the KSME**
Wonyoung Lee and Taesung Kim
- 3. Industry-Academia Joint Lecture on Next Generation HVAC-R**
Jaeseon Lee

1. Report on the Korean Society of Mechanical Engineering (KSME) Annual Meeting 2022



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KSME Annual Meeting took place face-to-face during November 9 to 12, 2022 in Jeju, South Korea. Totally 1206 papers were presented including 66 keynotes through 13 divisions in the conference. The share of number of the presentation in each division is seen in a pie chart below. In Thermal Engineering Division, totally 173 papers were presented including 5 keynotes through 29 sessions. Keynotes speeches were “Estimation of airborne virus transmission from indoor air-conditioning units” by Prof. Man Yeong Ha, Pusan National University, “Hydrogen turbine” by Prof. Tong Seop Kim, Inha University, “Thermal-hydraulic characteristic of fluids in open-cell porous metal fins” by Prof. Ji Hwan Jeong, Pusan National University, “Machine learning-based signal quantification in optical diagnostics for real-time monitoring of chemical reactors” by Prof. Moonsoo Park, Sungkyunkwan University, “Energy harvesting performance of thermoelectric generator and photovoltaic systems” by Prof. Tae Young Kim, Seoul National University of Science and Technology, and “Plasma applications” by Dr. Hyeong-U Kim, Korea Institute of Machinery & Materials.

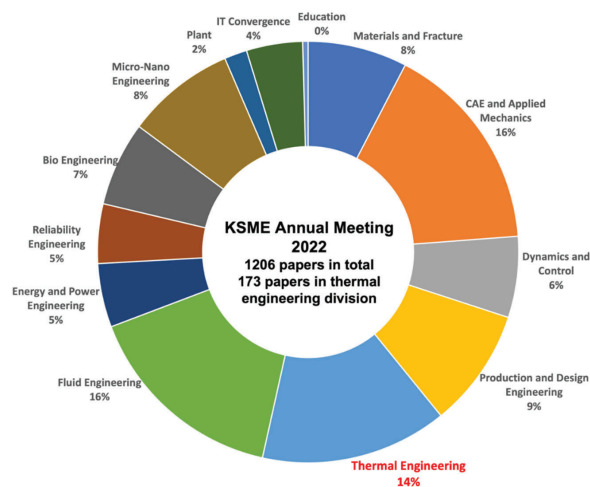


Fig. 2.1 Number of presentations at KSME Annual Meeting 2022

2. Special Topics in Journal of the KSME



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The Korean Society of Mechanical Engineering (KSME) publishes the monthly Journal of the KSME. In addition to the trends in mechanical engineering, this journal provides information on the Internet, new technologies, new products, software, laboratories, and patents. It also contains interesting stories about our daily lives, such as university club introductions, essays, health information, life medicine, leisure, and more. The latest issue in February, 2023 contains the special topics about the recent trends in air conditioning and refrigerating systems. Six articles are published, including “R1233zd refrigerant based turbo refrigerating systems” by Dr. Cheolmin Kim, LG Electronics, “Dehumidifying air conditioning systems” by Dr. Insoo Hwang, Jyung Dong Navien, “Thermal air-conditioning systems for carbon net-zero” by Dr. Sungmin Woo, Samjungtech. “Mix-matrix membrane based dehumidifiers” by Prof. Minsung Kim, Joongang Chung-Ang University, “Solar radiation model research and applications” by Prof. Hyunjin Lee, Kookmin University, and “Polymer-based rotary regenerator type heat exchangers” by Prof. Dong-Wook Oh, Chosun University.

3. Industry-Academia Joint Lecture on Next Generation HVAC-R



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The Thermal Engineering Division (TED) of the Korean Society of Mechanical Engineers (KSME) held a seminar on new technology trends related to next-generation HVAC-R in collaboration with industry and academia. This joint seminar was held between October 20 and 21, 2022 in Yeosu, a southern seashore city in South Korea. In the first session of the seminar, speakers from the industry gave presentations on changes in the refrigeration and air conditioning industry following energy efficiency improvements, environmental regulations, and carbon neutrality. Three speakers from the industry conducted the seminar, and the topics of each presentation were as follows.

- ‘Introduction of main technologies of turbo chiller applied with alternative refrigerant (R1233zd)’, Cholmin Kim, LG electronics Co.
 - ‘Domestic dehumidification cooling system’, Insu Hwang, Kyungdong Navien Co.
 - ‘The Role of Thermally Driven Chiller for Carbon Neutrality’, Sungmin Woo, Samjung Tech. Co.
- Three speakers from academia gave lectures related to the issue, and the following topics were given.
- ‘Dehumidification technology using non-porous mix-matrix membrane’, Minsung Kim, Dept. of Mech. Eng. Chungang Univ.
 - ‘Research and application of solar radiation model’, Hyunjin Lee, Dept. of Mech. Eng. Kookmin Univ.
 - ‘An experimental study on the application of polymer materials to rotary regenerative heat exchangers’, Dongwook Oh, Dept. of Mech. Eng. Chosun Univ.

This seminar became an opportunity for 30 researchers in addition to 6 presenters to share various technical discussions and exchanges. The seminar is an annual event hosted by KSME TED. It was held on-line last year due to Covid-19 and then this year, it was held off-line again, so the enthusiasm for participation was high. In 2023, it is expected that the industry and academia will gather together again to become a venue for exchange on various topics related to thermal engineering.



Fig. 2.2 Industry-Academia Joint Lectures

Korea, Member of ICHMT, AIHTC, AUTSE (4)

1. 2023 Spring Conference of Thermal Engineering Division, KSME

Honghyun Cho

2. Future Development Workshop 2023: Advances in Thermal Engineering

Hoseong Lee

1. 2023 Spring Conference of Thermal Engineering Division, KSME



Honghyun Cho, Dept. of Mech. Eng., Chosun University, hhcho@chosun.ac.kr

The annual Thermal Engineering Division 2023 Spring Conference of “The Korean Society of Mechanical Engineers,” held from April 19th to 22nd, 2023, at the Paradise Hotel in Busan, served as a forum for collaboration, knowledge exchange, and the unveiling of groundbreaking research. Under the stewardship of conference Chairman, Professor Jung-ho Lee, the Organizing Committee orchestrated an intellectually invigorating gathering that showcased the pinnacle of thermal engineering expertise and innovation. With the Chairman of the Thermal Engineering Division, Professor Young Soo Chang, delivering the opening speech, the conference commenced on a note of utmost significance, setting the tone for four days of scholarly discourse, collaboration, and knowledge dissemination. In particular, Vice President Saik-ee Oh from LG Electronics delivered a lecture on “Case Studies of Industrial-Academia Cooperation in Thermal Engineering Applied to Home Appliances and Air-Conditioning Products.”

With a total of 635 participants from various fields, the conference exemplified the global reach and collaborative spirit of the scientific community. These diverse perspectives not only enriched the discussions but also fostered an environment ripe for interdisciplinary insights and cross-border collaborations. The focal point of the conference lay in the multitude of papers and presentations that encapsulated the cutting edge of thermal engineering. An impressive total of 341 papers were presented, showcasing a depth of ongoing research efforts in the field of energy storage, heat and mass transfer, fuel cell, phase change heat transfer, thermal system control/measurement, conduction/radiation heat dissipation technology, and refrigeration and cryogenic technology. Furthermore, Professor Byung Ha Kang from Kookmin University and Professor Jaeseon Lee from UNIST were honored with the Thermal Engineering Academic Award. Additionally, Professor Hyungsoo Lee from Chung-Ang University and Professor Seong Kyun Im from Korea University received the Young Researcher Awards.

Five informative lectures functioned as foundational sources of knowledge, delving into fundamental aspects of thermal engineering, disseminating invaluable insights, and stimulating discussions on critical subjects. The conference featured an impressive lineup of 16 keynote speeches, each representing a reservoir of wisdom that steered participants through the forefront of innovation and technological advancements within the field. Notable presentations included "Introduction to Research on Eco-Friendly Thermal Energy Systems and High-Efficiency Heat Exchangers" by Professor Chan Woo Park from Chonbuk National University and "The Future of Heat Pump Technology and Latest Research Trends" by Professor Minsung Kim from Chung-Ang University, among others.

Moreover, five special sessions, hosting 37 presentations, provided a concentrated examination of topics including energy solutions, chemisorption heat pump systems employing an electrochemical compressor, advancements in heat pipe heat exchangers utilizing phase change activation, and innovations in plus-energy-building. These sessions facilitated profound insights and fostered engaging debates, contributing significantly to the scholarly discourse in thermal engineering. A total of 132 oral presentations and 156 poster presentations offered a dynamic platform enabling researchers to effectively communicate their findings, exchange ideas, and gain invaluable feedback from their peers.



2. Future Development Workshop 2023: Advances in Thermal Engineering



Hoseong Lee, Dept. of Mech. Eng., Korea University, hslee1@korea.ac.kr

The Future Development Committee held its annual workshop, a spring academic lecture series, at Chosun University from July 3rd to 4th, 2023. The workshop aimed to address the growing global demand for energy and explore sustainable solutions for efficient energy supply and consumption.

Professor Seong Hyuk Lee at Chung-Ang University, Vice Chairman of Thermal Engineering Division and Chairman of the Future Development Committee, delivered the opening address. Professor Sunmi Shin from the National University of Singapore presented research on thermal engineering using photonic structures, focusing on the coherent thermal emission in a single nano-object. Professor Hyung Sub Sim from Sejong University discussed the development of smart functional nanoengineered materials for future hypersonic propulsion systems. Professor Joon Sang Kang from the Korea Advanced Institute of Science and Technology presented findings on high, low, and switchable thermal conductivities in solids. Professor Jeong-Heon Shin from Hongik University shared insights into the study of heat transfer phenomena in microchannels. Professor Dong In Yu from Pukyong National University introduced research on visualizing interface phenomena.

The workshop provided a platform for experts to exchange knowledge on cutting-edge research in thermal engineering, laying the groundwork for future advancements in the field. The event successfully brought together renowned scholars and researchers, fostering collaboration and innovation in the pursuit of sustainable energy solutions.



South Korea, Member of ICHMT, AIHTC, AUTSE (5)

1. 2024 Spring Conference of Thermal Engineering Division, KSME

Seong Hyuk Lee

2. Future Development Workshop 2024: Advances in Thermal Engineering

Taesusung Kim

1. 2024 Spring Conference of Thermal Engineering Division, KSME



Professor, Seong Hyuk Lee, School of Mech. Eng., Chung-Ang University, shlee89@cau.ac.kr

The 2024 Spring Conference of the Thermal Engineering Division of the Korean Society of Mechanical Engineers was held from April 24 to 27, 2024, at the Ramada Plaza Jeju Hotel on Jeju Island. This annual conference provided a platform for collaboration, knowledge exchange, and the presentation of groundbreaking research.

Under the leadership of the Conference Chairman, Professor Seong Hyuk Lee, the Organizing Committee meticulously hosted an academically profound conference, showcasing cutting-edge technologies and innovations in thermal engineering. The conference commenced with an opening speech by Professor Jungho Kim, President of the Thermal Engineering Division, setting the stage for four days of scholarly discourse, collaboration, and knowledge dissemination. In particular, Vice President Hoon Wee of Samsung Electronics delivered a lecture titled “Technological Challenges and Current Responses in the Home Appliance Industry.” His presentation offered valuable insights into the evolving landscape of home appliance technology and the industry’s challenges.

The 2024 Spring Conference of the Thermal Engineering Division brought together 646 participants from various fields, exemplifying the scientific community’s global reach and collaborative spirit. These diverse perspectives enriched the discussions and fostered an environment ripe for interdisciplinary insights and cross-border collaborations. The focal point of the conference lay in the multitude of papers and presentations that encapsulated the cutting edge of thermal engineering. An impressive total of 346 papers were presented, showcasing a depth of ongoing research efforts in the field of energy storage, heat and mass transfer, fuel cells, phase change heat transfer, thermal system control/measurement, conduction/radiation heat dissipation technology, and refrigeration and cryogenic technology. Furthermore, Professor Man Yeong Ha from Pusan National University and Professor Minsung Kim from Chung-Ang University were honored with the Thermal Engineering Academic Award. Additionally, Professor Dong In Yu from Pukyong National University and Professor Moon Soo Park from Sungkyunkwan University received the Young Researcher Awards.

Five informative lectures functioned as foundational sources of knowledge, delving into fundamental aspects of thermal engineering, disseminating invaluable insights, and stimulating discussions on critical topics. The conference featured an impressive lineup of eight keynote speeches, each representing a reservoir of wisdom that steered participants through the forefront of innovation and technological advancements within the field.



Moreover, four special sessions facilitated profound insights and fostered engaging debates, contributing significantly to the scholarly discourse in thermal engineering and two short courses were opened. A total of 346 oral and poster presentations offered a dynamic platform enabling researchers to effectively communicate their findings, exchange ideas, and gain invaluable feedback from their peers.

2. Future Development Workshop 2024: Advances in Thermal Engineering



Professor, Taesusung Kim, School of Mech. Eng., Sungkyunkwan University, tkim@skku.edu

The Future Development Committee held its annual workshop at Pukyong National University from August 30 to 31, 2024. The workshop featured eight invited talks from academia, industry, and a national laboratory. It aimed to build a strong global network that supports state-of-the-art research in thermal engineering. The workshop also aimed to address the growing global demand for energy and explore sustainable solutions for efficient energy supply and consumption.



Professor Taesusung Kim of Sungkyunkwan University, Vice Chairman of the Thermal Engineering Division and Chairman of the Future Development Committee, delivered the opening address. Professor Jae Sung Yun from the University of Surrey in the UK presented research on halide perovskite solar cells for next-generation space photovoltaics. Professor Soonwook Hong from Chonnam National University discussed the fabrication and characterization of solid oxide fuel cells using thin film deposition processes such as atomic layer deposition. Professor Doojoon Jang from Sungkyunkwan University presented findings on intrinsically stretchable, thermoelectric materials for highly sustainable thermal energy harvesting. Professor Dongchan Lee from the University of Seoul shared insights into boiling heat transfer phenomena and mechanisms in plate heat exchangers. Dr. Dong Hwan Shin and Dr. Chan Ho Song from the Korea Institute of Machinery & Materials (KIMM) introduced KIMM’s ongoing research on thermal ground planes and heat pumps. Dr. Nak Hoon Kim from LG Electronics shared insights into the role of thermal engineering in consumer electronics, while Dr. Jae Yeon Kim from Hyundai Motor Company discussed challenges in future mobility and associated thermal energy systems.

The workshop provided a platform for experts to exchange knowledge on cutting-edge research in thermal engineering, laying the groundwork for future advancements in the field. The event successfully brought together renowned scholars and researchers, fostering collaboration and innovation in pursuing sustainable energy solutions.

South Korea, Member of ICHMT, AIHTC, AUTSE (6)

- 1. 2025 Spring Conference of Thermal Engineering Division, KSME
Taesung Kim
- 2. Future Development Workshop 2025
Jaeson Lee
- 3. The 2nd Thermal Polaritonics Workshop 2025
Bongjae Lee
- 4. The 3rd Integrated Workshop on Electronics Cooling and Thermal Management (International Seminar on Thermal Management in High-Density Data Centers)
Jungho Lee

1. 2025 Spring Conference of Thermal Engineering Division, KSME



Taesung Kim, Dept. of Mech. Eng., Sungkunkwan University, tkim@skku.edu

The annual Thermal Engineering Division 2025 Spring Conference of “The Korean Society of Mechanical Engineers,” held from April 23rd to 26th, 2025, at Lotte Hotel Jeju in Jeju island, served as a forum for collaboration, knowledge exchange, and the unveiling of groundbreaking research. Under the stewardship of conference Chairman, Professor Taesung Kim, the Organizing Committee orchestrated an intellectually invigorating gathering that showcased the pinnacle of thermal engineering expertise and innovation. With the Chairman of the Thermal Engineering Division, Professor Seong Hyuk Lee, delivering the opening speech, the conference commenced on a note of utmost significance, setting the tone for four days of scholarly discourse, collaboration, and knowledge dissemination. In particular, Pil Hyun Yoon, Executive Director, LG Electronics delivered a lecture on “Energy-Saving Technologies Using Heat Pump Applications in Home Appliances and HVAC Systems.”

With a total of 769 participants from various fields, the conference exemplified the global reach and collaborative spirit of the scientific community. These diverse perspectives not only enriched the discussions but also fostered an environment ripe for interdisciplinary insights and cross-border collaborations. The focal point of the conference lay in the multitude of papers and presentations that encapsulated the cutting edge of thermal engineering. An impressive total of 400 papers were presented, showcasing a depth of ongoing research efforts in the field of energy storage, heat and mass transfer, fuel cell, phase change heat transfer, thermal system control/measurement, conduction/radiation heat dissipation technology, and refrigeration and cryogenic technology. Furthermore, Professor Hyung Hee Cho from Yonsei University and Professor Sung Jin Kim from Korea Advanced Institute of Science and Technology were honored with the Thermal Engineering Academic Award. Additionally, Professor Seung Hwan Ko from Seoul National University received the Namheon Academic Award, and Professor Tae Young Kim from Seoul National University of Science and Technology and Professor Jungwan Cho from Sungkyunkwan University received the Young Researcher Awards.

Six informative lectures functioned as foundational sources of knowledge, delving into fundamental aspects of thermal engineering, disseminating invaluable insights, and stimulating discussions on critical subjects. The conference featured an impressive lineup of six keynote speeches, each representing a reservoir of wisdom that steered participants through the forefront of innovation and technological advancements within the field.

Moreover, seven special sessions facilitated profound insights and fostered engaging debates, contributing significantly to the scholarly discourse in thermal engineering. A total of 400 oral and poster presentations offered a dynamic platform enabling researchers to effectively communicate their findings, exchange ideas, and gain invaluable feedback from their peers.



2. Future Development Workshop 2025



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The Future Development Committee hosted its annual workshop, part of the spring academic lecture series, at the Korea Institute of Machinery and Materials (KIMM) from July 7–8, 2025. The event focused on addressing the rising global demand for energy and exploring sustainable strategies for efficient energy production and use. A total of 105 early-career researchers registered, and four invited talks were delivered by leading domestic and international experts in next-generation thermal engineering.

The workshop opened with remarks by Professor Jaeson Lee of UNIST, Vice Chairman of the Thermal Engineering Division and Chair of the Future Development Committee. Presentations included Professor Jaesung Park (University of Nebraska–Lincoln) on thermo-fluidic applications of superhydrophobic surfaces, Professor Sangwoo Shin (SUNY Buffalo) on diffusion-driven particle transport in porous media, Professor Jiwoong Bae (Hanyang University) on phase transitions in semi-solid materials for advanced batteries, and Professor Siwon Yoon (Jeonbuk National University) on precise thermal control in smart farms and energy-saving technologies.

Overall, the workshop served as a forum for exchanging insights on frontier research in thermal engineering, strengthening collaboration among distinguished scholars, and paving the way for future innovations in sustainable energy solutions.



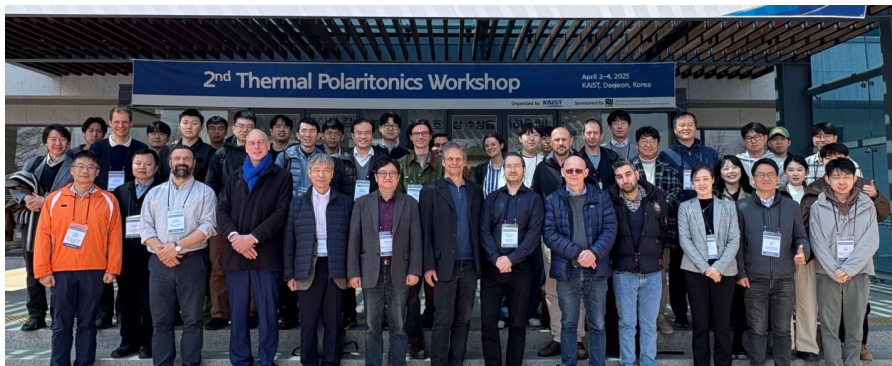
3. The 2nd Thermal Polaritonics Workshop



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The 2nd Thermal Polaritonic Workshop was held at the Korea Advanced Institute of Science and Technology (KAIST) from April 2–4, 2025. This exclusive event brought together leading researchers and their teams specializing in thermal radiation and heat conduction facilitated by surface phonon-polaritons and surface plasmon-polaritons at the nano- and microscales.

The workshop featured a broad spectrum of topics, encompassing fundamental research, applied studies, and interdisciplinary approaches to polariton-mediated heat transfer in dielectric and metallic materials. The program included 18 invited talks and 9 poster presentations, with participation from 37 researchers representing 7 countries.



4. The 3rd Integrated Workshop on Electronics Cooling and Thermal Management (International Seminar on Thermal Management in High-Density Data Centers)



Jungho Lee, Dept. of Mech. Eng., Ajou University, jungholee@ajou.ac.kr

The 3rd Integrated Workshop on Electronics Cooling and Thermal Management, held as the International Seminar on Thermal Management in High-Density Data Centers, took place from August 11–12, 2025, at the Seoul Plaza Hotel. Organized by the Thermal Engineering Division of the Korean Society of Mechanical Engineers, the workshop brought together academia, industry, and government to address advanced thermal management solutions for data centers and electronic systems.

Professor Nenad Miljkovic (University of Illinois at Urbana–Champaign) introduced holistic rack-to-processor power and thermal co-design concepts to optimize future server and data center performance. Professor Saeed Moghaddam (University of Florida) highlighted the potential of phase-change cooling to enhance energy efficiency in AI and IoT-driven data centers. Professor Yoonjin Won (University of California, Irvine) presented machine learning applications for two-phase heat transfer, offering insights into intelligent thermal management.

In addition to these keynote lectures, distinguished scholars and industrial leaders shared research advances on direct-to-chip cooling, jet impingement methods, immersion cooling for EV batteries, and defense electronics applications. Two poster sessions featured 36 student presentations, providing a platform for early-career researchers to showcase their work and exchange ideas with experts.

The workshop was further supported by major companies including Hanwha Aerospace, LG Electronics, SK Innovation, and others, which not only sponsored the event but also presented their latest developments in high-efficiency cooling systems, immersion fluids, and industrial thermal solutions.

Overall, the workshop successfully fostered cross-disciplinary collaboration and knowledge exchange, emphasizing the importance of innovative cooling strategies for sustainable growth in data centers, AI computing, and electrified mobility.

