

June 10th, 2025 NIMS

Announcement of NIMS Award 2025 Winners

The NIMS Award 2025 goes to Prof. Tsutomu Miyasaka, Prof. Henry J. Snaith, and Prof. Nam-Gyu Park who played pivotal roles in the development and practical application of the perovskite solar cell.

Summary

The National Institute for Materials Science (NIMS), headed by President Kazuhiro Hono, has decided to present this year's NIMS Award to:



Prof. Tsutomu Miyasaka Professor of Engineering, Toin University of Yokohama



Prof. Henry J. Snaith Professor of Physics, University of Oxford



Prof. Nam-Gyu Park Professor of Chemical Engineering, Sungkyunkwan University

The three recipients were recognized for their instrumental roles in developing the perovskite solar cell and for taking key steps toward its practical application.

This year's selection focused on the field of environmental and energy materials, with the aim of honoring exceptional achievements pertaining to "energy-related materials and technologies that pave the way toward a sustainable society". In addition to pioneering the research field of perovskite solar cells, the awardees were responsible for incorporating a critical element, the solidstate hole transport layer, which led to a dramatic improvement of the cell's stability and photoelectric conversion efficiency. The series of work has enabled this technology to come a long way toward practical application and was recognized as a truly global achievement.

The ceremony and recipients' lectures for the NIMS Award 2025 will take place during the NIMS Award Symposium, to be held on Tuesday, November 11th at the Tsukuba International Congress Center.

NIMS Award

Established in 2007, this international award is annually presented to researchers from one of the four major areas of materials science: 1. Environmental and Energy Materials, 2. Functional Materials, 3. Structural Materials, and 4. Basic Materials Science. The selection is based on a specific theme set each year and is conducted through a rigorous process by a committee consisting of leading experts from around the world.

■ NIMS Award Symposium

The NIMS Award Symposium honors the achievements of its winners and promotes academic exchange by bringing together researchers from around the world engaged in cutting-edge research. As in the previous year, the Symposium for 2025 will be held at the Tsukuba International Congress Center and will feature an award ceremony, the recipients' lectures, invited talks, and presentations by NIMS researchers.

Please visit the NIMS Award Symposium 2025 official website: https://www.nims.go.jp/nims-award-symposium/

Research Summary

Prof. Miyasaka was the first in the world to apply lead halide perovskite semiconductors—known for their high absorption coefficient in the visible light spectrum—to solar cells, opening a new research field for perovskite solar cells. The device design initially followed a wet-type similar to that of dye-sensitized solar cells, using an iodine-based electrolyte solution as the hole transport layer. This posed a stability issue, however, as the perovskite thin film would dissolve in the electrolyte. Later, through a collaborative effort between Prof. Snaith and Prof. Miyasaka, and in parallel with Prof. Park's independent research, a solid-state perovskite solar cell was developed using Spiro-MeOTAD as the hole transport layer. This innovation dramatically improved both stability and photoelectric conversion efficiency. The series of breakthroughs served as a major catalyst for global interest in perovskite solar cell research. Since then, numerous universities and companies worldwide have joined the race to develop this technology.

Impact on the Academic and Industrial Sectors

Research and development efforts are underway across many countries to scale up the surface area of perovskite solar cells and enhance their long-term reliability. Unlike crystalline silicon, the material used in the conventional silicon solar cells, which requires a high-temperature processing at around 1400°C, perovskite solar cells can be manufactured at a much lower temperature of approximately 100°C. This low-temperature process allows for production on lightweight and flexible substrates such as plastic. Researchers are also actively pursuing the development of tandem solar cells to utilize the solar spectrum more efficiently; since the band gap of perovskite materials can be adjusted by changing their composition, they positioned a perovskite on the top cell and materials, including crystalline silicon, CIGS, and GaAs, on the bottom cell.

In Japan, private companies ranging from major chemical manufacturers to start-ups are leading the charge in perovskite solar cell development. In addition to showcasing their technologies at the 2025 Osaka Expo, they have taken advantage of the lightweight and flexible nature of the perovskite devices to begin pilot installations in places where the use of silicon solar cells had been impractical. These companies have also initiated trial sales.

References: NIMS Award Winners of the Past Five Years and Their Achievements

Affiliation is at the time of the award

2020 Prof. Hiroshi Julian Goldsmid (The University of New South Wales, Australia)
 "Pioneer work on bismuth telluride thermoelectric material and its application for large-capacity optical communication systems using the Peltier cooling phenomenon"
 Prof. Kunihito Koumoto (Nagoya University, Japan)

"Development of environmental-friendly inorganic thermoelectric materials"

- Prof. Tsuneya Ando (Tokyo Institute of Technology, Japan, University of Tokyo, Japan)
 "Fundamental theoretical studies on quantum states of low-dimensional materials"
 Prof. Allan H. MacDonald (University of Texas at Austin, USA)
 Prof. Pablo Jarillo-Herrero (Massachusetts Institute of Technology, USA)
 "Pioneering work of new quantum physics by twistronics"
- 2022 **Prof. Teruo Okano** (Institute of Advanced Biomedical Engineering and Science, Tokyo Women's Medical University, Japan)

"Development of cell sheet engineering using temperature-responsive polymers and its application to regenerative medicine"

Prof. Kazuhiko Ishihara (Osaka University, Japan)

"Pioneering work in the development of biomimetic polymer biomaterials and their medical applications"

Prof. Donald E. Ingber (Wyss Institute for Biologically Inspired Engineering at Harvard University, USA)

"Proposal of the cellular tensegrity model and the invention of organ-on-a-chip technology"

2023 **Prof. Dierk Raabe** (Max-Planck-Institut für Eisenforschung GmbH, Germany) "Pioneering research on the sustainability and microstructure-based design of advanced metallic alloys"

2024 Prof. Yuichi Ikuhara (The University of Tokyo, Japan) "Contribution to material interface research through innovations in transmission electron microscopy" Prof. Franz Josef Giessibl (Institute of Experimental and Applied Physics,

University of Regensburg, Germany)

"Contribution to nanomaterial research through innovations in non-contact atomic force microscopy"

The list of past winners since 2007 can be found here: https://www.nims.go.jp/nims-award/en/award.html

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About **NIMS**

NIMS is designated as Japan's only national research and development institute specializing in materials science research. Materials science is fundamental to our lives. Substances make up our world, and it is materials that support our everyday lives. The materials we use can be broadly classified into organic/polymeric substances and inorganic substances. Most inorganic materials that we encounter can be further divided into metals and ceramics. Ever since the Stone Age and on through the Industrial Revolution until the present, human development has been accompanied by advancements in materials and their use. In recent years, materials science has been the focus of attention for the possible solutions to global environmental and resource issues that it may offer. As a national research and development institute specializing in this field, NIMS is committed to "Materials research for creating tomorrow". We work tirelessly on materials science research that will open the future.

[Reference page to know more about NIMS]

NIMS: A Unique Research Institute! <u>https://www.nims.go.jp/eng/nims/introduction.html</u> NIMS Vision <u>https://www.nims.go.jp/eng/nims/profile.html#vision</u>