Professor Hoon Hahn Yoon of the Department of Semiconductor Engineering receives '2D Material Young Scientist Award'... The only Korean to receive this year's honor

- Professor Hoon Hahn Yoon of the Department of Semiconductor Engineering, recognized by the Institute of Physics (IOP) for his research on new concept photoelectric devices based on two-dimensional materials... 'Single-pixel high-performance, ultra-compact computational spectrometer' evaluated as world's best and highest level

- The only Korean among the eight winners of 2025, received the award and gave an invited lecture at the international symposium on April 13... "I will devote myself to research on artificial intelligence semiconductors and quantum computing hardware devices"

▲ Professor Hoon Hahn Yoon of the Department of Semiconductor Engineering

The Gwangju Institute of Science and Technology (GIST, President Kichul Lim) announced that Professor Hoon Hahn Yoon of the Department of Semiconductor Engineering has been selected as the recipient of the '2025 2D Materials Emerging Young Scientist Award' presented by the international academic journal 《2D Materials》 published by the British Physical Society Press (IOP* Publishing).

Professor Hoon Hahn Yoon has been recognized worldwide for his contribution to the development of the 'Single-Pixel High-Performance, Ultra-Compact Computational Spectrometer,' a new concept photovoltaic device based on 2D materials that can effectively control the optical reactivity by wavelength, and he is the only Korean among this year's recipients.

* IOP (Institute of Physics): A world-renowned physics academic society based in the UK, founded in 1874 to promote and support education, research, and industrial applications of physics, with over 20,000 members worldwide. Through its own publishing organization, IOP Publishing, it provides accurate and influential academic research content centered on physics to academia and industry around the world.

From April 11 to 13, the 12th International Forum on Graphene in Shenzhen and the 1st International Conference on Two-Dimensional Materials were held at the Graduate School of International Studies at Tsinghua University in China.

Professor Hoon Hahn Yoon was selected as the recipient of the '2025 2D Materials Young Scientist Award' and gave an invited lecture. The awards ceremony was held on the 13th, the last day of the conference.

▲ Professor Hoon Hahn Yoon (sixth from the left) of the Department of Semiconductor Engineering at GIST is taking a commemorative photo with the winners at the IOP Publishing 2025 2D Materials Young Scientist Award ceremony held at the Graduate School of International Studies at Tsinghua University in China on the 13th.

2D materials are special materials that are composed of one or several layers of atoms and are very thin. The atoms are arranged in a single crystal structure on a plane, but there is no chemical bonding perpendicular to the plane, so they have the characteristics of ultra-thin film, transparency, flexibility, high strength, and the possibility of adjusting the properties by an external electric field. In particular, various novel quantum phenomena appear thanks to the quantum confinement effect in 2D materials.

Through various combinations of 2D materials, new quantum phenomena can be induced in a layered structure, and these can be applied to the development of high-performance, multi-functional, and new concept electronic, optical, optoelectronic, and spin devices. Therefore, 2D materials are receiving great attention as a core platform for AI semiconductors as well as quantum computing.

Professor Hoon Hahn Yoon focused on the fact that the photocurrent of a monochromatic light wavelength, which changes depending on each external voltage, can be effectively controlled due to the interlayer exciton phenomenon that appears in the van der Waals* heterojunction structure of a two-dimensional material.

He succeeded in developing a computational spectrometer that can precisely reconstruct a random incident light spectrum based on an artificial intelligence algorithm that learns the photoresponsivity of a two-dimensional material heterojunction device and grafts the Tikhonov regularization* method, which is a part of deep learning techniques.

The concept of a two-dimensional material heterojunction-based computational spectrometer developed by Professor Yoon is the first in the world and has achieved the world's highest level in terms of key spectrometer performance indicators such as accuracy of central wavelength, spectral resolution, and wavelength bandwidth.

* Van der Waals Force: Refers to the weak attractive force (or repulsive force) that occurs between molecules or between parts within a molecule. It is a very weak physical interaction, not a strong bond like a covalent bond or an ionic bond.

* exciton: A quasiparticle in which a negatively charged electron (-) and a positively charged hole (+) coexist as a pair, created inside a semiconductor or insulator. It is a concept that treats the collective movement that occurs when multiple particles interact when an electron is excited by external energy (e.g. light) as a single particle. When an electron is excited, the hole (positive hole) created in that location and the electron are loosely bound by electrical attraction.

* Tikhonov regularization: A mathematical technique used to stably solve problems that are prone to instability or overfitting. In particular, it is widely used when solving inverse problems, and is often utilized in the form of L2 regularization in machine learning and deep learning.

Professor Hoon Hahn Yoon said, “We are living in an era where high-density information processing and advanced semiconductor technology with high energy efficiency are required, and there are limits to advancing technology using only traditional methods of reducing the size of the device structure per unit area or increasing the number of devices.” He expressed his aspiration, saying, “With this award as an opportunity, I will further devote myself to research and focus on semiconductor device research for artificial intelligence semiconductors and quantum computing hardware based on special quantum phenomena expressed in two-dimensional materials.”

Meanwhile, the ‘2D Materials Young Scientist Award’ is awarded to a young scientist (born after January 1, 1985 as of 2025) who has demonstrated outstanding research achievements and high growth potential in the field of two-dimensional materials research. The winner will receive a commemorative plaque, cash prize, and the privilege of publishing an invited paper in the international academic journal 《2D Materials》.

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