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Ajou University, Worldcup-ro 206, Yeongtong-gu, Suwon 443-749, Korea www.ajou.ac.kr/en

Professor Sang-dun Choi receives 58th National Academy of Science Award

Professor Sang-dun Choi of the Department of Molecular Science and Technology, Ajou University, was named as the recipient of the 58th National Academy of Sciences Award in the basic natural sciences category. The awards ceremony was held in the National Academy of Sciences Building, Seocho-gu, Seoul on 13 Sept.

A total of five professors, including professor Choi, received awards at the ceremony. Professor Choi's is known for publishing the Encyclopedia of Signaling Molecules, which contains the general descriptive names and registered names of various genes and proteins, historical background of genes, functions of protein mechanisms and diseases, etc. The Encyclopedia, published last year, presents information about 4,000 genes in the human genome.

Professor Choi said, "It is a great honor to receive the NAS Award together with other eminent scholars of Korea." He added, "I will devote myself to becoming a great scientist." He is planning to update and improve the Encyclopedia (currently in three volumes) to extend to six volumes.

The NAS award is given to Korean scholars who have made significant contributions to the development of the sciences through research and academic pursuits. A total of 222 scholars have been awarded since 1955. Each recipient of the award this year received a cash prize of KRW 50 million. Professor Lee Yong-il of Seoul National University was the co-winner of the award, in the basic natural sciences category, along with Professor Choi. Professors Choi Jeong-yeon and Han Jae-yong, both of Seoul National University, were co-winners in the applied natural sciences category, and Dr. Kim Jong-geon, now professor emeritus at Korea University, received the award in the humanities category.

Team led by Professor Ju Min Kim discovers core principle of portable blood analyzer

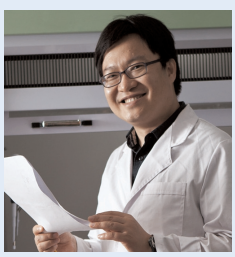
The team led by Professor Ju Min Kim (picture), of the Energy System/Chemical Engineering Department of Ajou University, recently discovered micro particles lined up in an ultra-low concentrate DNA solution. The research, which is expected to greatly contribute to the development of a blood analyzer, was published in Nature Communications, the online-only journal designed to publish across all disciplines in the natural sciences.

The Ministry of Science, ICT and Future Planning announced. on Oct 13. that Professor Kim and his team had discovered a central line-up of micrometer sized particles (one millionth of a meter) in a flow of ultra-low concentrate DNA solution.

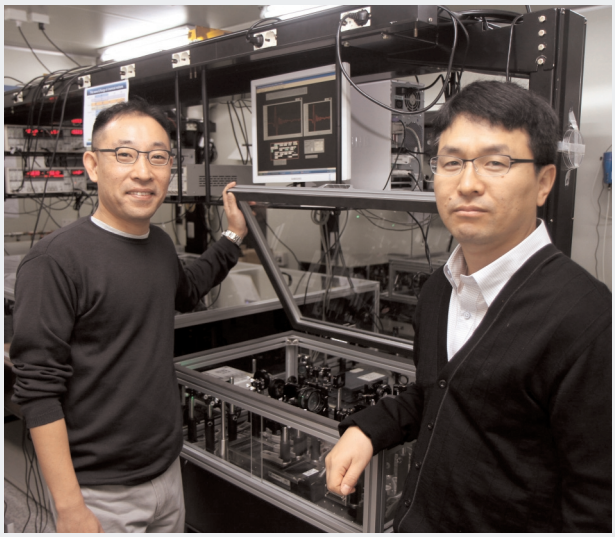
This research is expected to facilitate the future development of micro electrochemical impedance biosensors, devices which will enable individuals to conduct blood exams at home, eliminating the need to visit hospitals for the procedure. This is because portable blood analyzers require condensation technology for micro particles, such as cells, in order to ensure the accuracy of analysis. Existing blood analysis devices require additional equipment, such as complexly structured channels or electricity generators.

Professor Kim said, "Once this research develops further, the commercialization of not only portable blood analyzers but also high-performance cell analyzers can be accelerated."

Meanwhile, Kyo-won Kang, a graduate student of the Energy System Department of Ajou University, was first author on the published paper.



Team led by Professor Oh-phil Kwon and Sang-min Lee develop T-ray core materials



An Ajou University research team has succeeded in developing high-output broadband terahertz radiation or T-ray. Terahertz radiation can penetrate fabrics and plastics, so it can be used in surveillance, electronic and medical devices, such as security screening to uncover concealed dangerous materials, inspect products after packaging or to detect cancer cells.

Professor Oh-phil Kwon (Department of Molecular Science and Technology, right) and Professor Sang-min Lee (Department of Energy System, left) developed new materials that play a key role in generating highly-efficient broadband T-ray, greatly enhancing the generation efficiency of T-ray. Their paper was published in Scientific Report, an online-journal from the publishers of Nature, on Nov 13.

Terahertz or T-ray is an electromagnetic wave. It passes through substances that optics or x-rays can't pass through. T-rays have large potential in the field of hidden objects detection because they are not harmful to humans.

One of the reasons why T-ray was not widely used for detection or imaging devices is that most of T-rays were low-output and failed to cover the broadband, which limits the range of detectible substances. However, the materials newly developed by the Ajou research team have enabled the generation of highly efficient broadband T-rays. The new materials make up for the weakness of T-rays, expanding the scope of application.

Furthermore, the new materials only require simpler processes and lower costs compared to the existing materials, thus holding great promise for industrial and medical application. For example, an envelope containing a white powder looks ambiguous and looms ominously to the naked eye. With the existing technology such as x-ray, it is difficult to spot what kind of substance the envelope contains without opening it. But with the help of T-ray imaging, you can decipher whether the powdery parcel contains hazardous substances or not, even without opening it. T-rays help you to recognize inherent patterns of a substance and enable you to compare them with an existing database to identify whether the powdery parcel is hazardous or not.

Terahertz radiation can be used to detect objects that are not solid, such as liquids, so it can be used to detect hazardous liquid materials and identify damaging tissues, such as cancer tissues. Also, since it transmits through substances that are not electro-active while reacting strongly to electro-active metals, it is expected to supplement or replace the existing detection or analytic techniques.

X-ray can be used to detect and image only solid substances, electromagnetic waves can be used only for metals, and optics only for areas visible to the naked eye.

Professor Kwon and Professor Lee said, "The newly developed materials will improve the existing terahertz technology, making it easier to see through things invisible to the naked eye, such as concealed objects and packaged products." They also added, "We expect the new materials will apply to a variety of technologies."

Their research was funded by the "Senior Researcher Support Project" carried out by The Ministry of Science, ICT and Future Planning, the Ministry of Education and the National Research Foundation of Korea. The research of Ajou University was also reported in local media, including the Chosen Daily, Kyunghyang Daily, Seoul Economy Newspaper and YTN.

Professor Dong-wan Kim's Research Selected as 2013 'Best 10 Study'

The study results of the team led by professor Dong-wan Kim, of the Energy System, were selected as Seoul Daily's Best 10 Study of 2013.

Seoul Daily selected the Best 10 Study of the Year 2013: a list that has had great significance in terms of scientific research and industrial development.

Professor Kim's study selected by Seoul Daily was "Scalable One-Pot Bacteria-Templating Synthesis Route toward Hierarchical, Porous-Co3O4 Superstructures for Supercapacitor Electrodes." His paper was published in Scientific Report, an online-journal from the publishers of Nature issued on July 31.

Seoul Daily describes "Professor Kim's study is about synthesizing a nano powder that could be used on the electrodes of supercapacitors located on the surface of bacteria." It added "The supercapacitors have a lower energy density than a lithium ion battery but are capable of rapid recharging and discharging a high power density. The supercapacitors represent a next-generation energy storage device that is highly efficient and semi-permanent and can be used as an alternative for subsidiary batteries or as battery substitutes."

Seoul Daily also presented the study results of the Kunkuk University team lead by Professor Wan-Soo Choi, Korea University team led by Professor Ji-Hoon Ahn, Sungkyunkwan University team led by Professor Tae-il Kim, Pusan National University team led by Professor Tae-ho Hwang, Hanyang University team led by Professor Ho-beom Park, Postech team led by Professor Kwang-soo Kim, UNIST team led by Jin-young Kim, University of Seoul team led by Professor Jong-beom Lee and Seogang University team led by Professor Tae-wook Kang along with those of Professor Dong-wan Kim's team.

Kyungil Kim and Myung-woo Nho of the College of Social Sciences release book publications

The second half of 2013 saw the publication of numerous books by faculty members of Ajou University's College of Social Sciences. Professor Kyungil Kim (Dept. of Psychology) wrote Psychology of Wisdom, which explains the major principles of cognitive psychology with a wealth of real-life examples, while Professor Myung-woo Nho (Dept. of Sociology) shows in About Living Alone, Sociology of Solitude and The Sociology of The Common People's Everyday Life a sociologist's perspective on the world in which we live.

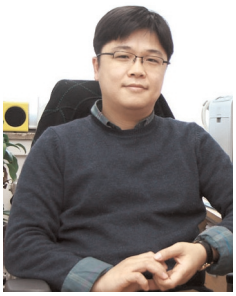
Professor Kim's Psychology of Wisdom offers an easy-to-understand explanation of the principles behind the "thoughts" that determine the words we use and actions we take on a daily basis. Professor Kim employs real examples involving anxiety, judgment, and rationality to explain operation principles and errors of thought. The book also provides a detailed explanation of the concept of motive, which has a significant influence on the human psyche, judgment process, and desire to take on challenging tasks, and offers a description of "the secret of thought," a theory stating that it is how we think that determines human happiness.

Professor Kim stated that "if we can understand the working principles behind our thoughts, we can find solutions for the various problems, big and small, that we encounter in our lives." He also emphasized the importance of wisdom, noting that, "The first step in becoming wise is an understanding of the principles of our thoughts."

Professor Nho's About Living Alone Sociology of Solitude and The Sociology of The Common People's Everyday Life are both reflections on today's Korean society from a sociological perspective. In About Living Alone Sociology of Solitude, Professor Nho presents his argument that the increasing number of single-person households is now an inexorable social phenomenon for which society must sufficiently prepare itself. Believing that "living along is an unavoidable reality that no one is exempt from, the only difference being the duration of time spent alone," he states that these single-person households as well as all other members of Korean society must collectively ponder the question "How are we to live together?"

In The Sociology of The Common People's Everyday Life, Professor Nho discusses the problems of human life and everyday existence based on his life experiences as a sociologist. The book analyzes the sociological significance of hidden aspects of the "inner flesh" of Korean society through the use of keywords such as common sense, "luxury good," religion, anxiety, neighbor, success, hobby, and suicide.

Professor Hwan Myung Kim and team develop florescent molecular sensor for detailed pH measurement



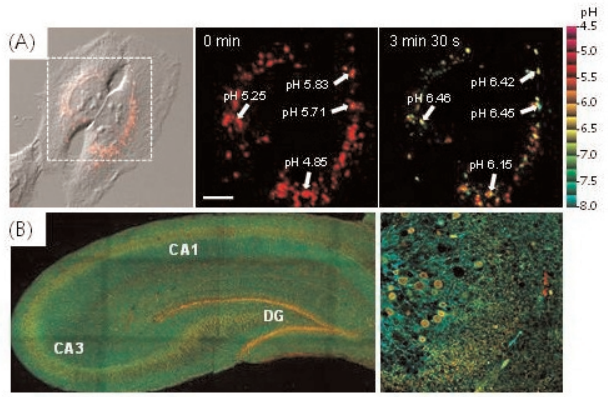
Professor Hwan Myung Kim (Department of Chemistry, Department of Energy System, picture) and his team have developed a florescent molecular sensor for detailed pH imaging. The newly developed sensor greatly helps in the detailed measurement of intracellular pH, holding great promise for early diagnosis of diseases and intracellular mechanism analysis.

Changes in tissue pH can lead to changes in signal transduction and the immune system that are closely related to cancer and neurological disorders, which has recently been drawing keen attention of the medical and pharmaceutical researchers. Unfortunately, however, the research in this field is still in the infant stage and the need to develop technology for tissue pH measurement has been growing.

The sensor developed by Professor Kim and his team is a substance that dissolves easily in water. It dissolves easily in a tissue from the human body. When exposed to infrared light, each part of the tissue has a different color depending on the pH. The different colors present pH differences within a tissue, and it is possible to observe pH changes with vital activity, which can be immediately visualized through a microscope. The florescent sensor enables the observation of one micrometer, smaller than the size of a cell. There was no way for detailed measurement of intracellular pH in the past. However, with the help of the newly developed sensor, it is now possible to analyze the pH of biological tissue below pH 0.1 units.

The team succeeded in videotaping changes in the pH of lysosome (pH 4.5~6.5) in real-time (picture A). Lysosomes are the cell's waste disposal system and can digest some compounds. The vitality and pH changes of lysosomes have received keen attention from many scientists and researchers, but there has been no case of direct observation thus far. The team also presented the acidity distribution of the brain tissue of a live mouse and successfully discovered that certain parts of the tissue had higher pH (picture B). With the help of the sensor newly developed by Professor Kim and his team, it is now possible to detect and observe changes in pH, opening up new possibilities for exploring undiscovered biological phenomena or disease aetiology.
Professor Kim said, "The florescent molecular sensor can be used to observe a wide range of biological phenomenon going on within living cells and tissues." He added, "Since a disease starts from molecular units or above, the new sensor has obvious biomedical applications, such as recognizing illness trajectory and early diagnosis."

This research was funded by the "Senior Researcher Support Project" carried out by The Ministry of Science, ICT and Future Planning, the Ministry of Education and the National Research Foundation of Korea. The research was published in the Journal of the American Chemical Society dated on Nov. 27th



Office of International Affairs
Ajou University, Worldcup-ro 206, Yeongtong-gu, Suwon 443-749, Korea www.ajou.ac.kr/en
newsletter@ajou.ac.kr