KOACH – User Report

KOKEN LTD.

Stanford Nanofabrication Facility at Stanford University begins use of open clean air system "KOACH"

Koken has decided to expand the KOACH business, which has been carried out only in Japan, to foreign markets, and has determined that the first base for this expansion will be the United States, a powerhouse of innovation that is aiming to regain its position in semiconductor development.

As a first step in moving forward with this plan, Koken has begun approaching open labs※1 in the semiconductor field, aiming to install actual KOACH units. As a result, a Stand KOACH "KOACH C900-F" has been installed at the Stanford Nanofabrication Facility (SNF).

※1 Open lab is a research facility that brings together students and researchers from a wide variety of fields, encouraging interaction and collaborative research between researchers with the aim of generating innovation.

Stanford Nanofabrication Facility (left) and the interior of the laboratory

Interview

Koken spoke with Mary Tang who is in charge of communicating with external companies.

Mary Tang
Managing Director, Stanford Nanofabrication Facility

Since 2013, Mary has been Managing Director, but has been part of SNF for 25 years. Before coming to Stanford, she was a process engineer at Intel, completed a doctorate on DNA nanoparticles from the University of California at San Francisco and Berkeley, and a post-doctoral fellowship in bioanalytical devices at Berkeley.

Tell us about Stanford University and SNF.

Stanford University is located in the heart of "Silicon Valley", playing a key role in technology hardware and software, from research and development to commercialization.

SNF is an R&D and prototyping facility serving not only its students, but researchers from university, industry, and governmental institutions across the U.S. and around the world for over 30 years. SNF is centered on a 10,000ft^2 cleanroom housing instruments for device fabrication, and also includes satellite laboratories supporting Metal Organic Chemical Vapor Deposition (MOCVD), new Experimental Fabrication methods (ExFab) and an electronic shop for Systems Prototyping (SPF).

More than a lab, SNF is a dynamic, user community of nanofabrication. In 2023, SNF served over 600 researchers, including 180 industry users from about 70 companies.

Our industry users represent the established notables, such as Applied Materials, TSMC, and Bosch, as well as numerous small- and medium-sized companies, especially startups. One recent success story is Raxium, a micro-LED company acquired in 2022 by Google. Other successes include InvenSense (acquired by TDK), Matrix Semiconductor (acquired by SanDisk), Unity Semiconductor (acquired by Rambus), Grandis (acquired by Samsung), SiTime, and Silicon Light Machines.

Interior of SNF

What types of researchers use SNF?

Since its launch in 1994, SNF has supported the experimental needs of well over 500 companies. In addition to companies, SNF also served many researchers from 10 other universities (such as UC Berkeley and UC San Francisco), not-for-profit agencies, and government research labs (such as SRI/PARC, SLAC, and LLNL).

While its technology core is electronics, SNF welcomes researchers from all disciplines wishing to explore uses of micro- and nanofabrication. In addition to electronics, we support researchers in applications ranging from medicine and biology to fundamental physics and astronomy.

Koken explained their nano-fiber filter manufacturing and airflow control technologies, as well as the features of KOACH to the SNF staff.

Potential collaborative activities between Koken and SNF were also discussed.

External researchers from industry, government and other universities access our facilities under a Service Center Agreement, under which the University makes no claim to any intellectual property (IP) brought to or developed while using SNF. Since 1994, these generous IP terms have enabled SNF to support the experimental needs of well over 500 companies.

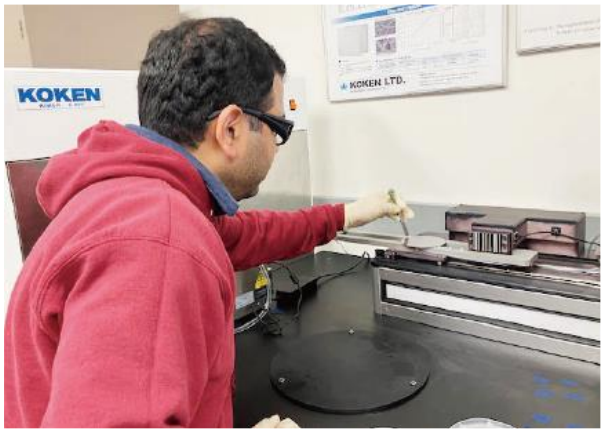
We understand that SNF has been selected as an "Innovation Hub" for the U.S. national semiconductor development project, "Microelectronics Commons." Please tell us about this project.

In October of 2023, Stanford University, along with the University of California, Berkeley, were selected to lead the California-Pacific-Northwest AI Hardware Microelectronics Commons Hub (Northwest AI Hub), one of eight Microelectronics Commons※2 regional Innovation Hubs awarded by the U.S. Department of Defense (DoD).

The Northwest AI Hub is receiving $15.3 million in funding this year. In total, the eight hubs will receive a total package of $238 million, the largest to date under the CHIPS and Science Act※3. The Northwest AI Hub includes more than 40 institutional members, from academia, government laboratories, and industry.

※2 The Microelectronics Commons is an initiative by the U.S. Department of Defense to establish eight Innovation Hubs for semiconductor research and development in order to ensure that the U.S. leads the world in the field of microelectronics.

※3 The CHIPS and Science Act is a U.S. law that was enacted in August 2022. A large budget totaling $280 billion has been set aside, including approximately $52.7 billion to strengthen semiconductor manufacturing capacity in the United States. Of these, strengthening semiconductor manufacturing capabilities is said to be more than just an industrial policy; it also includes the aim of strengthening economic security. (JETRO website entitled “What impact will the newly launched CHIPS program have on the supply chain? (US)”



A wafer is placed on the measuring device installed between the push hoods of KOACH C900-F.

KOACH C900-F

"KOACH C900-F" will be used at SNF. What prompted this?

Last year, we received a call from a representative of Koken who said, "We would like to introduce to SNF an innovative clean air device that can achieve the world's highest level of air cleanliness in an open space."

After discussing the matter with my colleagues, many of them wished to hear more details, so I met with the representative from Koken. When I actually heard about KOACH, I was impressed by how an ISO Class 1 clean air space can be created in a short amount of time, and how easy it is to work with because the clean air space can be created in an open state.

Leading the Innovation Hub will increase SNF's role in semiconductor research and development, but unfortunately the SNF's cleanrooms are already full. Using KOACH makes it easy to create a clean air space even in a room with an atmospheric environment, so I found it appealing that we could use it to carry out work that should normally be done in a clean air space.

What kind of work do you use the "KOACH C900-F" for?

We use KOACH when analyzing the electrical resistance of wafer materials using a device called "non-contact sheet resistance meter."

Wafers are typically made from a material called silicon. Recently, however, new materials such as gallium nitride, silicon carbide, and diamond have been attracting attention as wafer materials. We use the “non-contact sheet resistance meter” to characterize these non-silicon materials before taking the wafers to manufacturing facility in cleanroom for processing.

Before introducing KOACH, researchers used the analyze device in an airborne environment. The next step would take place in cleanroom, so they had to decontaminate the wafer before bringing it into the cleanroom.

On the other hand, KOACH creates an ISO Class 1 clean air space where particles are virtually absent, with less than 10 particles of 0.1 μm diameter per one cubic meter. By working in the clean air space created by KOACH, wafers will not be contaminated, eliminating the need for researchers to decontaminate wafers before bringing them into the cleanroom.

What do you expect from Koken and KOACH in the future?

Stanford University's selection as a leader of the Innovation Hub will expand the role of our semiconductor laboratory. We need to build a new laboratory and add cleanrooms, but it is difficult in the short term.

With KOACH, we can easily create a clean air space in a room with an existing atmospheric environment. We would like to continue to discuss ways to utilize KOACH with Koken and deepen our collaborative relationship.

Thank you for taking time to share this interview with Koken. Koken looks forward to working with you.

By installing KOACH at the Stanford Nanofabrication Facility, researchers from many semiconductor-related companies will not only be able to see it but will also be able to actually use it. From now on, with Stanford University as Koken’s starting point, Koken will further focus on increasing awareness and sales of KOACH in the U.S. market.