

SEL Frontiers in Technology – a unique scholarship opportunity



A challenge and a unique experience – do your M.Sc. thesis at Semiconductor Energy Laboratory Co., Ltd., sponsored by Dr Shunpei Yamazaki – the top patent holder in the world!

[Semiconductor Energy Laboratory Co., Ltd.](#) (SEL) offers Swedish students (up to three persons per year) master thesis projects at the company's headquarter in Atsugi (60 km southwest of Tokyo), for contributing to the promotion of friendship between Sweden and Japan. SEL is a very unique company engaged in innovative R&D, prototyping, and patenting novel technologies. Revenues from licensing and collaborative research are invested in further R&D, which creates a sustaining intellectual property creation cycle. Over the years, SEL has developed some of the world's top-class semiconductor materials and device technologies, including low-temperature continuous grain silicon (CGS) and *c*-axis aligned crystalline (CAAC) oxide semiconductor (OS) transistors. It holds the majority of the patents in the field of OS (as of March 2020). The company has approximately 700 employees, mainly young researchers. The founder and president of the company, Dr Shunpei Yamazaki, holds over 17,000 patents (as of October 2021), including fundamental patents on flash memory technologies, and organic light-emitting diode (OLED) and liquid crystal displays (LCDs). Dr Yamazaki is a foreign member of the Royal Swedish Academy of Engineering Sciences (IVA).



Dr Shunpei Yamazaki founded the company in 1980. He holds over 17,000 patents (as of October 2021) and renewed his own Guinness World Record in 2016. While a Ph.D. student at Doshisha University, he invented the basic device for non-volatile (“flash”) memory. He was awarded honorary degrees and the title of “Friends of Doshisha” in 2011 and 2015, respectively. He was awarded the Medal with Purple Ribbon by the Japanese government for the innovation of MOS LSI element technology in 1997 and was the winner of the Okochi Memorial Technology Prize in 2010. He is a life fellow of the IEEE, a member of the Japan Society of Applied Physics, and a foreign member of the Royal Swedish Academy of Engineering Sciences since 2009. He is the author or co-author of over 500 scientific publications. In 2016 he renewed his own Guinness World Record with 11,353 patents. He has received several awards and decorations in Japan and abroad for his research and innovations.

The M.Sc. thesis projects (“exjobb”) currently being offered are:

1. **Battery:** Examination of fabrication conditions (on-site only) of high-Ni $\text{LiNi}_{1-x-y}\text{Co}_x\text{Mn}_y\text{O}_2$ (NCM) electrodes and data analysis (on-site or on-line)
2. **Organic electroluminescent (EL) materials:** Analysis of sublimation temperatures of organic EL materials using artificial intelligence and machine learning (onsite or online internship)
3. **LSI process:** Optimization of oxide semiconductor materials and device structures using machine learning (onsite internship).

Duration: 6 months

Deadlines for Application:

- Application period open: March 15th, 2022
- First Screening: June 1st, 2022
- Second Screening: October 15th, 2022

Financial support:

SEL will cover international airfare and offers a salary which covers all normal living costs. The student will stay at the dormitory for SEL staff, which is within walking distance from the office. SEL provides several evening courses and sports activities such as tennis, football, basketball, baseball, badminton, climbing, skiing, and snowboarding.

Background of the student(s):

The required student qualifications depend on the project but could be, for example, solid state physics, semiconductor physics, crystallography, materials engineering, organic chemistry, inorganic chemistry, electrochemistry, physical chemistry, electrical and electronic engineering, circuit theory, computer science, mathematics. Knowledge of Japanese is an advantage, but not required.

Contact:

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Notes:

- You need to find a supervisor/examiner.
- Application period until the quota is filled, i.e., apply now!
- The project mode (on-site or on-line) may change depending on the COVID-19 pandemic. According to Japanese infection prevention and control guidelines for COVID-19, students may be requested to provide polymerase chain reaction (PCR) test certification before and after entering Japan, and a quarantine period after entering Japan.
- Please be aware that an applicant who was scheduled to visit Japan might need to change the program to an on-line internship.
- We would like to as far as possible offer projects according to the schedule and requests of students.