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News

An Assistant Professor at the Graduate School of Science has won the 2nd prize at the 2nd National Science, Technology & Innovation in 2024.

The Outstanding Cambodian Scientists Awards has been initiated by the National Council for Science, Technology and Innovation (NCSTI) and the Ministry of Industry, Science, Technology & Innovation (MISTI), coordinated by the General Department of Science. The initiative aims to highlight the value of knowledge generated through scientific research aligned with the eight priority areas outlined in the National Research Agenda 2025. The eight priority areas are local food, reliable energy supply, quality education, electronic and mechanical spare parts, cloud-based services, electricity and potable water, carbon neutrality, and digitally enhanced health.

The application was open for one month, from February 14, 2024, to March 13, 2024. The selection committee would have selected the best based on the set criteria. According to a guideline of the Outstanding Cambodian Scientists Awards, some basic criteria for eligibility and evaluation for the award included degree holders with at least a Master's degree, having publications (research papers, textbooks) in recognized publishers, conference presentations, thesis supervisions, grants received, recommendations from a researcher in the field, and a clean record regarding professional ethics and criminality. The committees, consisting of seven members, are selecting the top three 'Outstanding Cambodian Scientists'; they consist of the following components:

- Minister of MISTI,
- Representative of the Advisor Board of NCSTI,
- Invited international researcher,
- Dr. HUL Seingheng, USS and Head of Secretariat of 2nd National STI Day 2024;
- Dr. TRY Sophal, Director General of STI, and
- Invited private sector from enterprise association, industrial association, or else.

At the Gala Dinner held on March 24, 2024, the recipients of the prestigious awards were formally revealed. Dr. SOUM Veasna was one of the awardees and proudly accepted the 2nd prize at the 2nd National Science, Technology & Innovation event of 2024, focusing on the theme of 'Electronic and Mechanical Spare Parts'. Delve into the pages ahead to explore the captivating narratives of his research endeavors and remarkable accomplishments within this domain.

Summary of Entry

Together for Printed Electronics

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Printing electronics, as a broad term, encompasses the methodology employed to fabricate electronic devices by printing on various substrates (Wu, 2022). This research field is closely aligned with the objectives outlined in the National Research Agenda (NRA) of Cambodia pertaining to "Electronic and Mechanical Spare Parts" (MISTI, 2023). Through my work, I have focused on formulating raw materials, including 3D printing filament and carbon nanotube ink, tailored for printing electronics. Additionally, I have dedicated efforts to developing cost-effective printing methods for the production of printed circuits and sensing components essential for electronic devices (Fig. 1).

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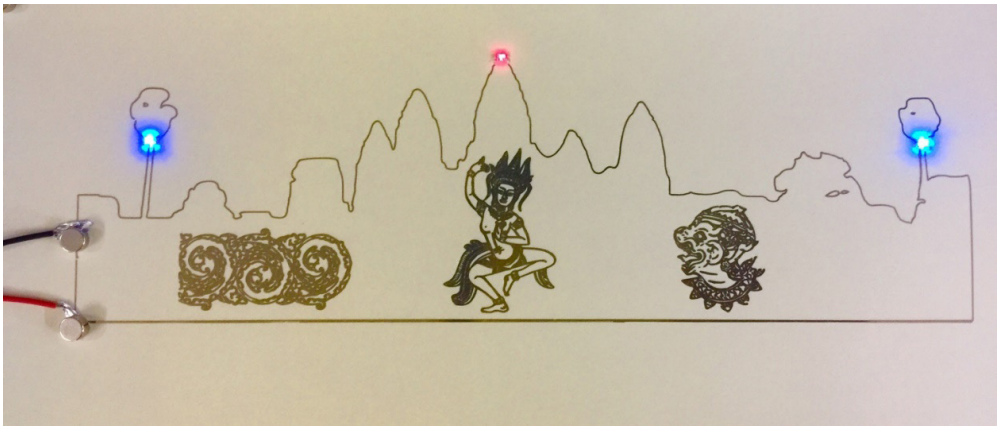

Fig. 1: Printed silver nanoparticle ink on paper substrate for producing electrically conductive patterns. 3 LEDs were attached to the patterns and lightning up when electrical voltage was applied.

I embarked on my research journey in printing electronics in 2015 when I was awarded a scholarship to pursue a master's degree at Sogang University. Under supervision by Prof. Kwanwoo Shin, my initial project focused on the development of a conductive filament for 3D printing, aimed at producing electrically conductive 3D objects for electronic components. Collaborating with my senior colleague, we published our findings in 2016 (Jo et al., 2016).

Subsequently, our interest turned towards printing thin film and flexible electronics using cost-effective technologies. Recognizing the limitations of 3D printing in achieving thin conductive patterns, we turned to the inkjet printing method. Inkjet printing proved to be a robust approach, capable of generating submicron-thin patterns suitable for mass production. Leveraging our inkjet printer and conductive ink, we successfully fabricated various electronic devices, including temperature sensors (H Chae, 2016), a digital microfluidic chip for multi-assay applications (Ruecha et al., 2017), and spoof fingerprints for smartphone security (Soum, Park, et al., 2019). At the same time, we explored low-cost printing technologies suitable for resource-limited settings, initiating research on ballpoint pen printing with a digital plotter. This printing system, requiring less than USD 500 to set up, demonstrated remarkable performance in fabricating electrochemical sensors (Soum et al., 2018; Yukird et al., 2020) and affordable digital microfluidic chips (Soum, Kim, et al., 2019). Recognizing that the success of printing flexible electronics hinges on substrate characteristics such as flexibility, high-temperature curability, and surface roughness, we undertook research to develop a novel polymeric substrate tailored for this purpose (Soum et al.). Those research outputs significantly contribute to advancing industries involved in printed electronics, particularly in the production of electronic circuits, displays, sensors, digital microfluidics, and solar cells. Through our work, we have introduced innovative methods for the formulation of printing materials, including filament, conductive ink, and flexible substrates. These findings hold immense potential for industry applications, particularly in scaling up production for mass manufacturing. By offering simple and cost-effective printing methods, our research facilitates adoption at both laboratory and industrial scales.

Our research endeavors at the lab have received support from various sources, including the Higher Education Improvement Project (HEIP), currently backed by the Sweden-RUPP Bilateral Programme aimed at advancing our work in electrochemical sensors for glucose, uric acid, and cyanide detection using printing electronic technology. To further my career as a researcher, I understand the importance of securing resources, producing tangible outcomes, and cultivating networks within academia and industry. Presently, I oversee operations at the Materials and Fabrication Laboratory (MFL), a well-equipped facility dedicated to research in printing electronics. Within this laboratory, we have a team of eight students who are the manpower for research and development in printing electronics, with four of them focusing on printed electronic-related topics and others on the development of analytical sensing devices (Fig. 2).

The expertise in this domain significantly contributes to the realization of the NRA's objectives. With a dedicated research laboratory for printing electronics, I possess the capability to design and manufacture customized devices within Cambodia, thereby facilitating the advancement of electronic spare parts manufacturing in line with the NRA's goals. As a result, I was awarded 2nd prize in the "Outstanding Cambodian Scientists Awards" 2024 (Fig. 3). I would like to share this achievement with Prof. Kwanwoo Shin, Graduate School of Science, Royal University of Phnom Penh, and MFL members for their invaluable support in this accomplishment.

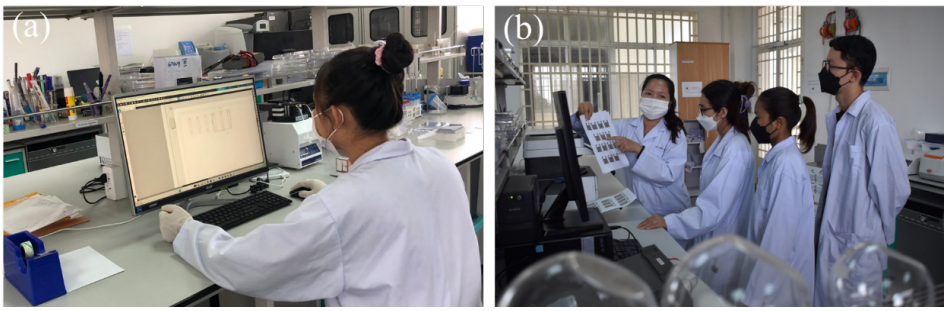

Fig. 2: Activities of students doing their research in printing electronics: from (a) Design circuits to (b) printing those functionalized conductive patterns.

Fig. 3: (a) A sharing section about printing electronics research, research, and impact and (b) The awarding ceremony for the 2nd prize winner in the theme of 'Electronic and mechanical spare parts' in the 2nd National Science, Technology & Innovation, 2024.

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