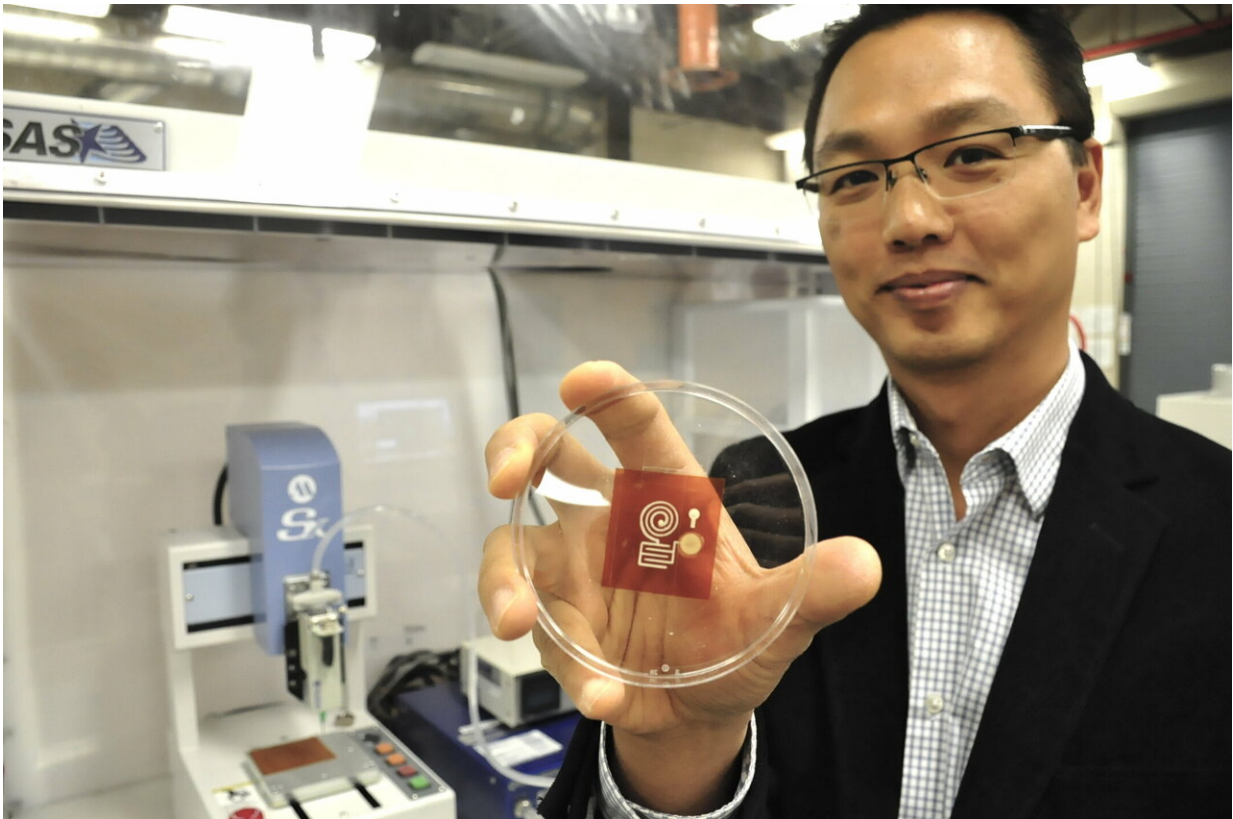


Collaboration sparks sustainable electronics manufacturing breakthrough

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SFU Mechatronic Systems Engineering professor Woo Soo Kim is collaborating with Swiss researchers to develop an eco-friendly 3D printable solution for producing wireless Internet-of-Things sensors. The research team is using a wood-derived cellulose material to replace the plastics and polymeric materials currently used in electronics. Credit: SFU

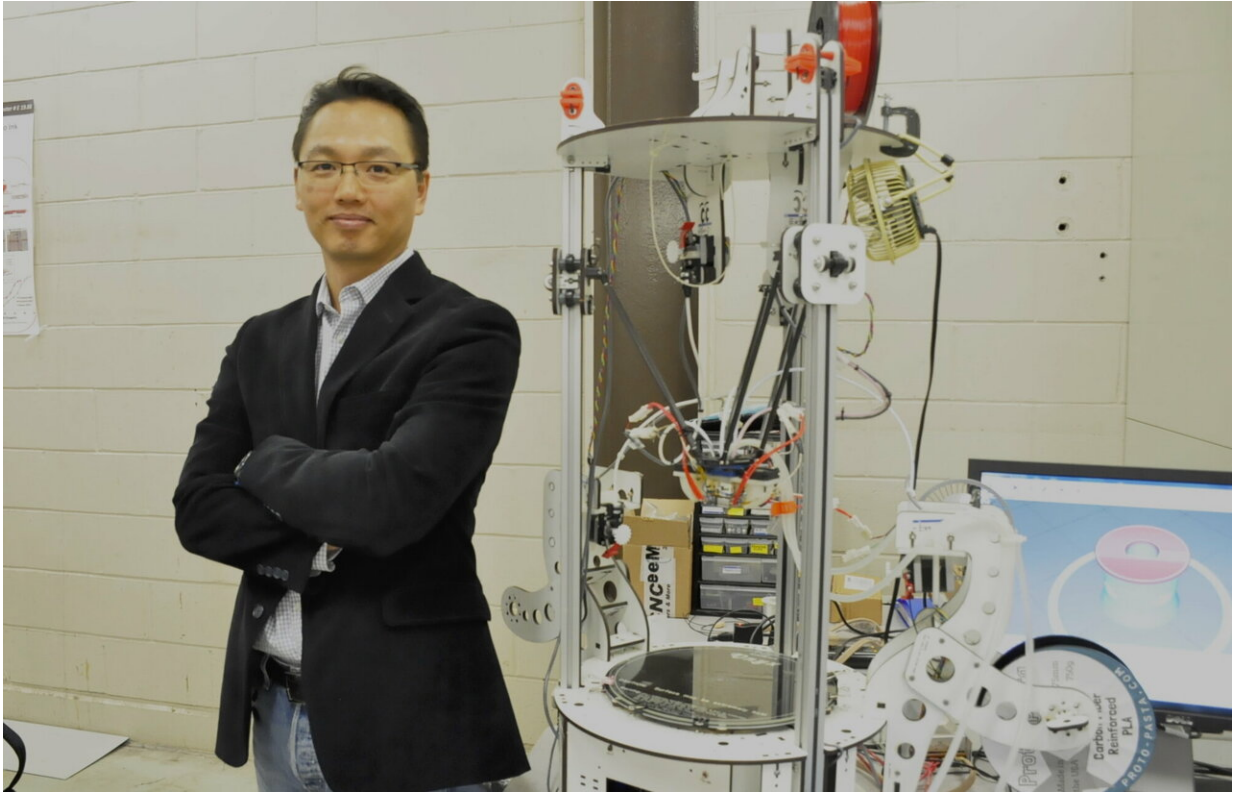
Simon Fraser University and Swiss researchers are developing an eco-friendly, 3-D printable solution for producing wireless Internet-of-Things (IoT) sensors that can be used and disposed of without contaminating the environment. Their research has been published as the cover story in the February issue of the journal *Advanced Electronic Materials*.

SFU professor Woo Soo Kim is leading the research team's discovery involving the use of a wood-derived cellulose material to replace the plastics and polymeric [materials](#) currently used in electronics.

Additionally, 3-D printing can give flexibility to add or embed functions onto 3-D shapes or textiles, creating greater functionality.

"Our eco-friendly 3-D printed cellulose sensors can wirelessly transmit data during their life, and then can be disposed without concern of environmental contamination," says Kim, a professor in the School of Mechatronic Systems Engineering at SFU's Surrey campus. The research is being carried out at PowerTech Labs in Surrey, which houses several state-of-the-art 3-D printers used by researchers.

"This development will help to advance green electronics. For example, the waste from printed [circuit boards](#) is a hazardous source of contamination to the environment. If we are able to change the plastics in PCB to cellulose composite materials, recycling of metal components on the board could be collected in a much easier way."



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Kim's research program spans two international collaborative projects, including the latest focusing on the eco-friendly cellulose material-based chemical sensors with collaborators from the Swiss Federal Laboratories for Materials Science.

He is also collaborating with a team of South Korean researchers from the Daegu Gyeongbuk Institute of Science and Technology's (DGIST)'s department of Robotics Engineering, and PROTEM Co Inc, a

technology-based company, for the development of printable conductive ink materials.

In this second project, researchers have developed a new breakthrough in the embossing process technology, one that can freely imprint fine circuit patterns on flexible polymer substrate, a necessary component of electronic products.

Embossing technology is applied for the mass imprinting of precise patterns at a low unit cost. However, Kim says it can only imprint circuit patterns that are imprinted beforehand on the [pattern](#) stamp, and the entire, costly stamp must be changed to put in different patterns.

The team succeeded in developing a precise location control system that can imprint patterns directly, resulting in a new process technology. This will have widespread implications for use in semiconductor processes, wearable devices and the display industry.

Earlier this year Kim was selected as a Brain Pool Fellow by the National Research Foundation (NRF) of Korea. An expert in 3-D printed electronics who heads SFU's Additive Manufacturing Laboratory, Kim spent six months collaborating with researchers at Seoul National University to advance fabrication of thin film transistors using 3-D printing technology.

More information: Taeil Kim et al, Electrochemical Sensors: 3D Printed Disposable Wireless Ion Sensors with Biocompatible Cellulose Composites (Adv. Electron. Mater. 2/2019), *Advanced Electronic Materials* (2019). [DOI: 10.1002/aelm.201970007](https://doi.org/10.1002/aelm.201970007)

Provided by Simon Fraser University

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