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<b>Release Date</b>	2020.02.20	

## Professor Dong-Seon Lee's research team develops a flexible thin film solar cell transfer technology for attachment to clothes, paper, PET, etc.

- Research has shown that wearable devices and solar cells, which can be worn like clothes, is no longer science fiction but reality.
- Gwangju Institute of Science and Technology (GIST, President Kiseon Kim) School of Electrical Engineering and Computer Science Professor Dong-Seon Lee's research team has developed CZTSSe (copper-zinc-tin-sulfur-selenium) flexible thin film solar cell transfer technology for attachment to any type of substance, such as clothes, paper, and PET.
  - CZTSSe thin film solar cells are characterized by replacing the elements indium and gallium with zinc and tin among the current components of the conventional CIGS (copper-indium-gallium-selenium) thin film solar cells. In addition, the price of solar batteries can be drastically reduced, which is advantageous for commercialization, and is attracting attention as the next generation eco-friendly solar cell because it is not toxic.
- CZTSSe thin film solar cells require more than 500 degrees of high temperature during the manufacturing process, and, in the past, the types of substrates were limited to metal foil or thin ceramic substrates to make the flexible solar cells, which were less flexible or expensive.

- To overcome this problem, Professor Dong-Seon Lee's research team transferred CZTSSe thin film solar cells made on glass substrates to flexible substrates to realize flexible thin film solar cells regardless of the substrate type.
  - The CZTSSe thin film solar cell were fabricated on a glass substrate through a high temperature process, and the glass was removed through wet etching by using mechanical etching and hydrofluoric acid. Then the CZTSSe thin film solar cells were completely transferred to desired substrates such as clothes, paper, and PET by using a protective layer such as thermal release tape while retaining 91% power generation after the transfer.
  
- Professor Dong-Seon Lee said, "The transfer method for flexible thin film solar cells, which is the result of this research, can be applied not only to CZTSSe thin film solar cells but also other thin film solar cells, and has infinite methods of utilization with wearable devices, IoT, and drones. We look forward to future applications and the the mass-production and commercialization of this technology."
  
- This research was led by Professor Dong-Seon Lee (corresponding author) and conducted by Dr. Jung-Hong Min (first author) and by Ph.D. student Woo-Lim Jeong (first author) with support from the GIST Research Institute (GRI), the Korea Institute of Energy Technology Evaluation and Planning (KETEP), and the Ministry of Trade, Industry & Energy (MOTIE) of the Republic of Korea and was published on February 10, 2020, in *ACS Applied Materials & Interfaces*, a prominent international journal of applied materials published by the American Chemical Society.

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