

Section of Public Affairs	Hyo Jung Kim Section Chief (+82) 62-715-2061	Nayeong Lee Senior Administrator (+82) 62-715-2062
Contact Person for this Article	Professor In Seop Chang School of Earth Sciences and Environmental Engineering (+82) 62-715-3278	
Release Date	2020.02.12	

Professor In Seop Chang's research team suggests a way to overcome the challenges of commercializing microbial fuel cells (National Research Foundation of Korea)

- Microbial fuel cells * are studied in earnest to avoid having to return astronauts' solid waste back to Earth. Although microbial fuel cells are a future energy that can produce electricity while treating solid waste, practical commercialize is difficult due to low efficiency.
- Research results were introduced to expedite practical application amid continuous demand for microbial fuel cells, such as wearable devices charged with sweat and power production using sewage from treatment sites.

* microbial fuel cells: Electrons and hydrogen ions produced in the process of microorganisms decomposing organic matters, such as sweat and waste water, generate electricity through electrodes. It has the advantage of being highly stable, sustainable, and environmentally friendly.

- A research team at the Gwangju Institute of Science and Technology (GIST, President Kiseon Kim) led by School of Earth Sciences and Environmental Engineering Professor In Seop Chang has proposed a solution to overcome the voltage reversal phenomenon, one of the obstacles for commercializing microbial fuel cells.

- This achievement is noteworthy because it was published as a 'Review' paper by the international journal *Cell Press*, which means that the research contains significant developmental trends for the relevant field of study.
- Because microbial fuel cells have a low theoretical generation of voltage, the researchers increased the output by connecting unit cells in a longitudinal direction, that is, in a series.
 - One of the obstacles to the practical use was the voltage reversal phenomenon, in which the unit cell voltage frequently reversed, degrading the performance of the entire system.
- Although papers have been published on the characteristics and possible causes of the phenomenon, no solutions have been found to resolve it.
 - The research team has also conducted in-depth studies on the causes of voltage reversal phenomena and published their findings in various international journals, identifying factors that contribute to the voltage reversal phenomenon, including the cathode and anode.
- As a result of these continuing studies, the research team discovered that the root cause of the voltage reversal phenomenon was due to the performance difference between the unit cells that make up the system.
 - The research team found that the solution was to minimize the difference in reaction rates between the positive and negative electrodes in the unit cell or the imbalance of performance between the unit cells.
 - The research team proposed the term 'state of current production' for each unit cell and suggested a way to maintain balance among them.
- The research team plans to first apply the proposed method by integrating microbial fuel cell systems with oxidoreductase and will continue their research on the efficiency of microbial fuel cells on macro systems.
 - The results of this research were supported by the Ministry of Science and ICT and the National Research Foundation of Korea and were published on January 21, 2020, in the international journal *Trends in Biotechnology*.

