

Simultaneous electricity generation and filtration of wastewater

February 23 2023



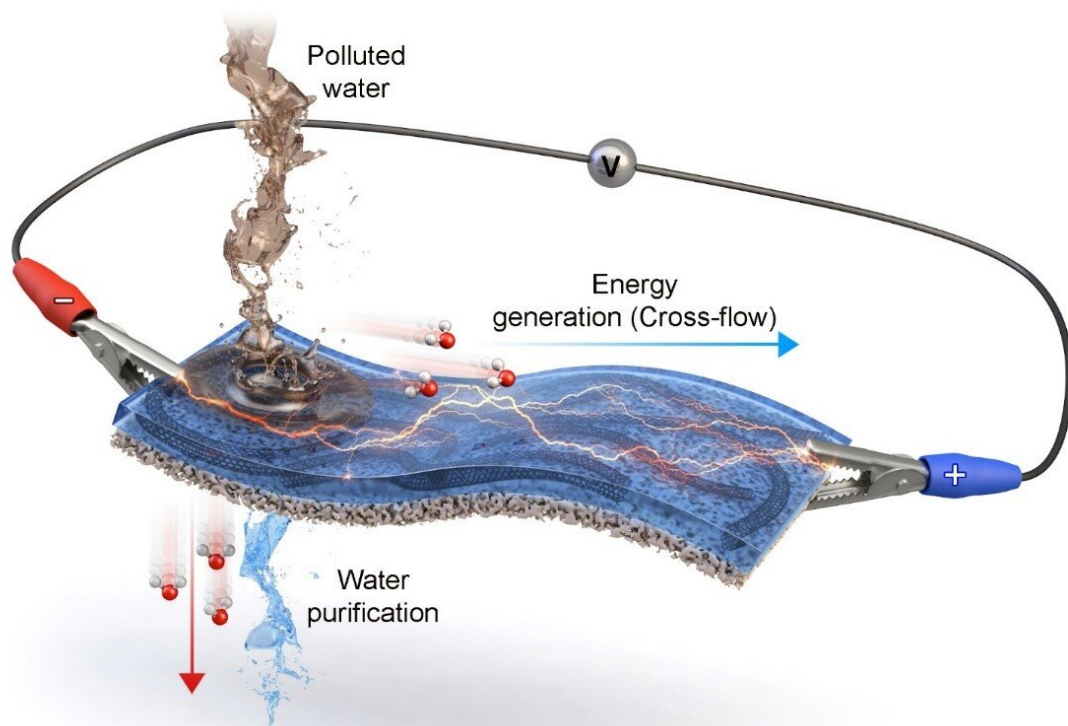
Electricity generation and water purification membrane developed by the KIST-Myongji University joint research team. Credit: Korea Institute of Science and Technology

The purification of various water resources, such as rain, seawater, groundwater, river water, sewage, and wastewater, into potable or usable

water is a high-energy process. But what if electricity could be generated during the water purification process? A joint research team has now developed a multifunctional membrane that can simultaneously generate electricity while purifying wastewater into drinking water.

The Korea Institute of Science and Technology (KIST) has announced that Dr. Ji-Soo Jang's team from the Electronic Materials Research Center and Prof. Tae-Gwang Yoon's team from the Department of Materials Science and Engineering, Myongji University have jointly developed an advanced [membrane](#) that can simultaneously provide drinking water and generate continuous [electricity](#) from various water resources, such as sewage/wastewater, seawater, and groundwater.

The "sandwich-like" membrane is composed of a porous membrane that filters water at the bottom and a conductive polymer that generates electricity at the top. The membrane is designed to purify wastewater by controlling the direction of the water flow. Water flowing perpendicularly to the membrane generates [direct current](#) by the movement of ions in a horizontal direction. The membrane can reject more than 95% of the contaminants of sizes less than 10 nm. Hence, microplastics and heavy metal particles in wastewater can be removed, and continuous electricity can be generated for more than 3 h with only 10 μl (microliter) of water.



Schematic illustration for the operation of the electricity generation and water purification membrane developed by KIST-Myongji University joint research team. Credit: Korea Institute of Science and Technology

Since the membrane can be manufactured using a simple printing process without size restrictions, it has a high potential to be commercialized due to its low manufacturing costs and [processing time](#).

The research team is currently conducting follow-up research to generate electricity while improving the water quality of [wastewater](#) to the level of drinking water by developing the membrane for an actual factory. Dr. Ji-Soo Jang from KIST expressed his opinion on the research saying that, "As a novel technology that can solve [the] water shortage problem and

produce ecofriendly energy simultaneously, it also has great potential applications in the water quality management system and emergency power system."

This research was published in *Advanced Materials* and selected to be featured on the front cover of the issue.

More information: Ji-Soo Jang et al, Bidirectional Water-Stream Behavior on a Multifunctional Membrane for Simultaneous Energy Generation and Water Purification, *Advanced Materials* (2022). [DOI: 10.1002/adma.202209076](https://doi.org/10.1002/adma.202209076)

Provided by National Research Council of Science & Technology

Citation: Simultaneous electricity generation and filtration of wastewater (2023, February 23) retrieved 10 April 2024 from <https://techxplore.com/news/2023-02-simultaneous-electricity-generation-filtration-wastewater.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--