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**Title:**

**Biopolymer/MXene Composite 2D Membranes for Osmotic Power Generation**

**Authors & affiliations:**

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**Abstract:** (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will ‘expand’ over 2 pages as you add text/diagrams into it.)

**Preparation of Your Abstract**

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word **ONLY** (place names excluded). No full stop at the end.

2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract

Methods: Describe your selection of observations or experimental subjects clearly

Results: Present your results in a logical sequence in text, tables and illustrations

Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

Membrane-based reverse electrodialysis is a future technology to capture the “blue” osmotic energy between seawater and fresh water for large-scale industrial and domestic electricity supply. Two-dimensional metal carbide and nitride (MXene) is emerging as a promising material to construct lamellar ion channels. The recovery of extracellular polymeric substances (EPSs), containing various biopolymers, has become a hotspot in the field of wastewater treatment.

Herein, we demonstrate EPSs/MXene composite 2D membranes as high-performance nanofluidic osmotic power generators. The charged EPSs derived from the excess sludge in wastewater treatment plants (WWTPs) are selected as an intercalating and interlocking agent between MXene nanosheets. The composite membrane exhibits charge-governed ion transport and shows good cation selectivity. By mixing artificial secondary effluent in WWTPs and sea water, the output power density can achieve 5.89 W/m<sup>2</sup>, twice as that without EPSs. This study proposes to construct a novel coupling technology with recycling resource and energy in wastewater treatment.