Important notes:

Do **NOT** write outside the grey boxes. Any text or images outside the boxes **will** be deleted.

Do **NOT** alter the structure of this form. Simply enter your information into the boxes. The form will be automatically processed – if you alter its structure your submission will not be processed correctly.

Do not include keywords – you can add them when you submit the abstract online.

Title:

Functionalized Graphene Oxide-Based Ion Exchange Membranes for Osmotic Energy Conversion

Authors & affiliations:

Please do not include Personal Data (email address, postal address, etc.) in this field. Include only author names & affiliations

H.S.Chae[1], H. Cho[1], J. Kim[1], C.-S. Han[1]*
[1]Korea University, Korea

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

Graphene oxide (GO) membranes have been numerously investigated in the fields of water purification and energy application. Merit to their 2D channels comparable to the size of ions and the surface charge, GO membranes is considered as a prospective template for ion exchange membranes in that they can sieve out the ions by steric exclusion and the electrostatic repulsion. However, the swelling of membranes in aqueous environment and the lack of ion exchange capacity seriously deteriorate the ion selective properties of the two-dimensional (2D) membranes including GO. To deal with the current limitation, increase of the surface charge and control of the interlayer spacing is the most crucial strategies for GO-based ion exchange membranes.

Herein, we have developed the functionalized GO membranes using polyelectrolytes with high charge density. The polyelectrolytes consisting of carboxyl (COO^-), sulfonated (SO_3^-) and amine (NH_3^+) are well-known to endow the ion exchange capacity to the membranes. The GO membranes were functionalized by the polyelectrolytes such as polyacrylic acid (PA) and polyethyleneimine (PEI), and utilized in osmotic energy conversion. The pristine GO membranes usually have a low selectivity of 2.3 for Na^+/Cl-, however the selectivity was increased over 10 after functionalization of PA. Also, the cation-selective properties of GO membranes with negative charges can be changed to anion-selective properties by tuning their surface charge with positively charged PEI. By assembling the oppositely charged GO membranes and realizing the reverse electrodialysis cells, the energy efficiency and power density was highly improved. These strategies for chemical modification of 2D membranes can provide the opportunity to efficiently engineer the energy applications and other ionic devices.