Scientific recognition for Dr. Amir Lohrasebi

A paper by Dr. Amir Lohrasebi with his collaboration entitled “Ion separation and water purification by applying external electric field on porous graphene membrane” has been accepted for publication in the ***Nano Research*** journal (IF=7.354). The School of Nano Science congratulates this achievement to Dr. Lohrasebi , our part-time associate, and his colleague.

Description:

The lack of sufficient available freshwater resources is one of the most important problems in our world. One of the promising methods in freshwater production is membrane desalination via reverse osmosis (RO). As the desalination performance via RO is depended greatly on the membrane structure, whereby wide studies have been concentrated on designing the high-performance membranes. To search a potential high-efficiency membrane for desalination, both of water permeation and salt rejection should be considered simultaneously. In the literature survey of this subject, thin-film composite membranes made by polyamide and carbon-based membranes have been investigated greatly. It was found that membranes made of polyamide can reject salt ions highly, while their water permeability is low. On the other hand, it was shown that membranes based on graphene sheets have high water permeability and high salt rejection.

However, the graphene membranes, with a high rate of ion rejection and high water permeation, have a few disadvantages. First, while removing salt ions, all other mineral partials, may be also removed, which are essential to human’s health. Second, the fabrication of graphene membranes is expensive procedure. Third, desalination plants usually have wide environmental impacts on their eco-system.

In this research, a new mechanism based on the application of an external electric field on the porous graphene membranes was suggested. This method not only increases fresh water production performance but also controls the ions passage through the porous graphene (as an approach to overcome the first mentioned disadvantage). For this purpose, a system consisting of two bilayer graphene membranes, which were exposed to two opposite directions external electric fields was designed to produce fresh water and ion separation, computationally. It was found that when the system was exposed to the electric field of 10 mV/Å and higher, the ion rejection was more than 93%. The obtained results of this study could be useful in designing high efficient membranes that are employed in water purification processes.

[1] A. Lohrasebi, S. Rikhtehgaran, To appear in ***Nano Research*** (2017)
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