Desalination menbranes using graphene oxide liquid crystals may soon help bring down costs of clean water access

Large-area desalination membranes to be developed using graphene oxide liquid crystals may soon help access to clean water at low cost through energy efficient means.

Access to clean water is an increasing challenge. Current startegies to address the problem are plagued with high cost and energy.

In order to address the problem in a sustainable manner Dr. Suryasarathi Bose, Associate Professor Indian Institute of Science (IISc) ,Bangalore one of the recipients of this year's Swarnajayanti Fellowship of the Department of Science and Technology (DST) plans to develop large-area 'printed' desalination membranes derived from external stimulus like magnetic and electric field and shear forces aligned graphene oxide liquid crystals.

Dr Bose's research group is already involved in designing membranes, using polymeric blends as a template which are robust and easy to fabricate and with a unique set of properties like high flux, low fouling, chlorine resistant and so on. To further improve the properties of the membrane, he proposes to design membranes with amphiphilic (having both hydrophobic and hydrophilic properties) graphene oxide (GO) consisting of both polar (oxygen containing functional groups like COOH, OH and -O-) and non-polar parts (graphitic structure) that can be explored for nanofiltration and desalination applications.

Currently, his group at the Indian Institute of Science (IISc), Bangalore is involved in designing membranes using phase separation in polymeric blends like in polyethylene (PE) and polyethylene oxide (PEO) as a template with a gradient in pore sizes. Such structures can offer ample opportunities in various separation technology in general and water remediation in particular. The flux through these novel membranes is quite high as compared to conventional membranes owing to these unique nano-channels created by selective etching. This research work has been published in the '*Journal of Materials Chemistry A.*'

His research group has also developed novel materials that can trap heavy metals, are antibacterial, and can resist biofouling-- one major concern in separation technology as it affects the performance of the membranes severely. Membranes derived using the above techniques can further be explored for water remediation in general and desalination applications in particular.

The membrane Dr Bose plans to fabricate pooling all these properties together and improving them further, will have potential applications in the desalination of brackish water, will be affordable and less energy-intensive. The plan is quite relevant to the Indian context given that the freshwater aquifers are either getting contaminated due to rampant disposal of organic waste resulting in leachate that enters the nearby water bodies or are drying out due to rapid urbanization resulting in encroachment of aquifers.

Publication link : https://doi.org/10.1039/C4TA03997A

For further details contact Dr Dr. Suryasarathi Bose (sbose@iisc.ac.in).