Membranes with functionalized nanomaterials: To maximizing the permeability and selectivity

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New applications for membrane separation are emerging from the water-energy nexus, environmental needs and purified natural resources. All membranes exhibit a trade-off between permeability and selectivity. However, ingenious membrane materials design is able to overcome the trade-off, and factors other than permeability and selectivity that govern membrane performance and, in turn, influence membrane design. This presentation will share the latest research initiatives o membrane materials and separation in our group. Firstly, the integration of MOFs into the fabrication of nanofiltration membranes enhances the polymerization process, refines the microstructure of the polyamide separation layer, accelerates the transport of water molecules, and improves ion rejection. Then, the selectivity of polymer membranes for lithium–magnesium separation is enhanced through host–guest effects and the Donnan effect by incorporating nanomaterials. Lastly, synergistic interactions between functionalized nanomaterials and two-dimensional membrane materials, such as GO and MXene, optimize steric hindrance and electrostatic interactions improving membrane performance. In addition, the presentation will explore current research in the removal of small-molecule organic pollutants by modified polymer membranes.

Biography: Dr. Fang Li is the professor of the college of Environmental Science and Engineering at Donghua University. His research focuses on membrane-based processes for affordable wastewater reclamation, advanced materials for water decontamination technologies and environmental regulatory frameworks in the textile industry. Served as Principal Investigator for multiple research projects, including the National Natural Science Foundation, the National Key R&D Program, and the Water Special Program, drafting two national environmental standards. From 2008, awarded the Second Prize of the National Sci &Tech Progress Award once, and five ministerial-level Sci &Tech Progress Awards. Published over 180 paper and authorized more than 30 patents.