Innovation toward Sustainability in Water Treatment and Desalination through 2D Material

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Freshwater scarcity and the energy–intensity of conventional desalination demand transformative materials and processes. In this talk, I will share our group's progress on leveraging two-dimensional (2D) materials to push water treatment toward higher efficiency, lower fouling, and reduced lifecycle impacts. Building on my lab's foundation in novel separation processes at Khalifa University, we develop membranes and electro-sorption platforms that exploit the angstrom-level tunability, rich surface chemistry, and high conductivity of graphene-derived sheets, MXenes, and covalent organic frameworks (COFs) [1-4]. This talk aims to map a pathway where 2D materials enable compact, electrically driven, and fouling-resilient desalination with smaller chemical and energy footprints—bringing sustainable, fit-for-purpose water closer to reality in arid and industrial settings.

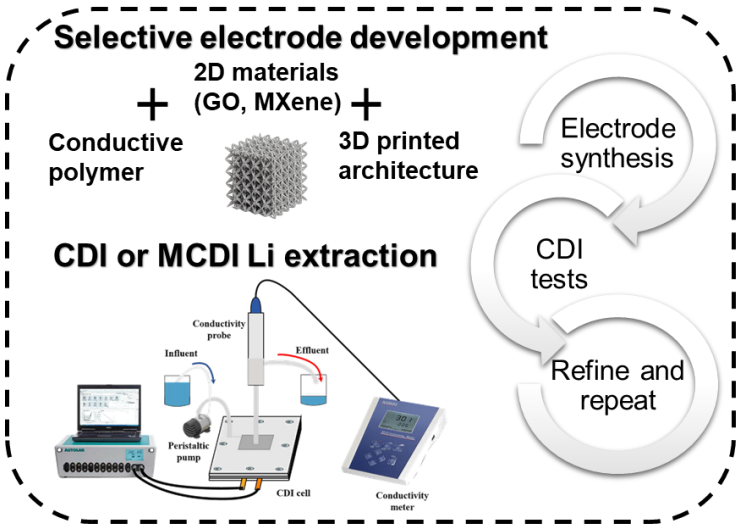

Fig.1 Example of current research efforts on utilizing 2d material for CDI application.

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