QU Vision of Water R & D Priorities for localization of Technology and Knowledge Sharing

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Introduction

- Water Security as a Grand Challenge in Qatar National Vision 2030 and Qatar National Research Strategy: Promoting integrated water resources management
- QU Research pillar with emphasis on water and water-related studies
- Research Focus
  - Water treatment technologies (desalination, wastewater treatment)
  - Water quality monitoring and environmental assessment
  - Membrane processes and advanced materials for water applications
- Collaborations with international partners on water challenges
- Development of innovative technologies for Qatar's arid climate
- Educational Outreach: Dedicated to building expertise in water science and technology.

Qatar University's Water Research Initiatives

Water Research Unit and Water Technology Unit (CAM):

Advanced research equipment and facilities

Innovative water treatment processes and systems

Membrane technology development and applications

Pilot-scale testing and process optimization

UNESCO Chair on Water Reuse:

International collaborations and knowledge exchange

Student and researcher mobility programs

Advanced research on water reuse and recycling

Addressing water challenges in the MENA region

Capacity-building and knowledge dissemination

Emerging Technology and Future vision

Forward Osmosis Seawater Pretreatment for Thermal and RO Desalination Plants

Nanofiltration/RO
Pressure Retarded System

Electrodialysis-based and Reverse ED Hybrid Systems

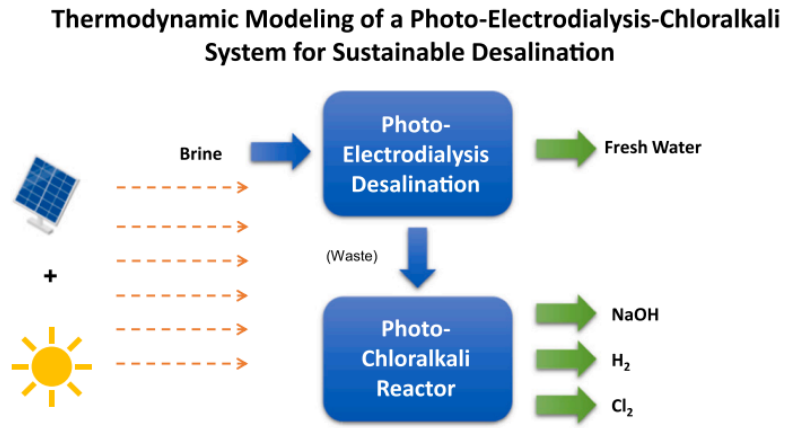
Membrane Distillation system

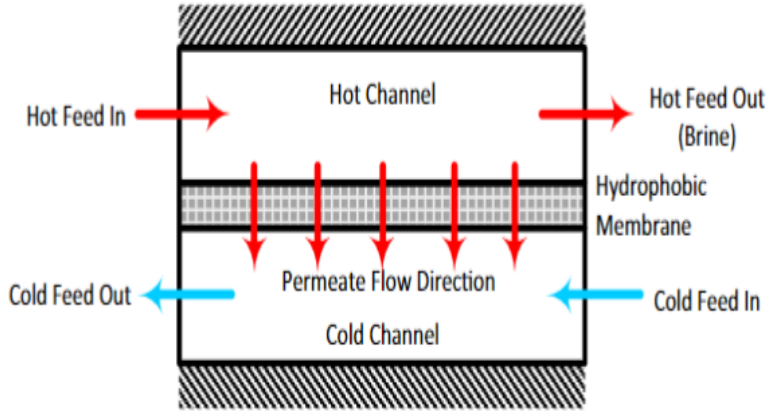
Brine Mineral Mining

Research Advancements at Qatar University

- Qatar University (QU): MD
  - Explored membrane distillation (MD) and energy parameters.
  - Examined the impact of membrane properties, feed water properties, mass transfer, heat transfer, and system parameters on energy parameters.

- Qatar University (QU): PRO
  - Explored membrane modification for pressure retarded osmosis (PRO).
  - Investigated various nanomaterials, including zeolite, graphene oxide, and carbon nanotubes, for enhancing PRO performance.
  - Focused on maximizing power generation from salinity gradient resources.





Research Advancements at Qatar University

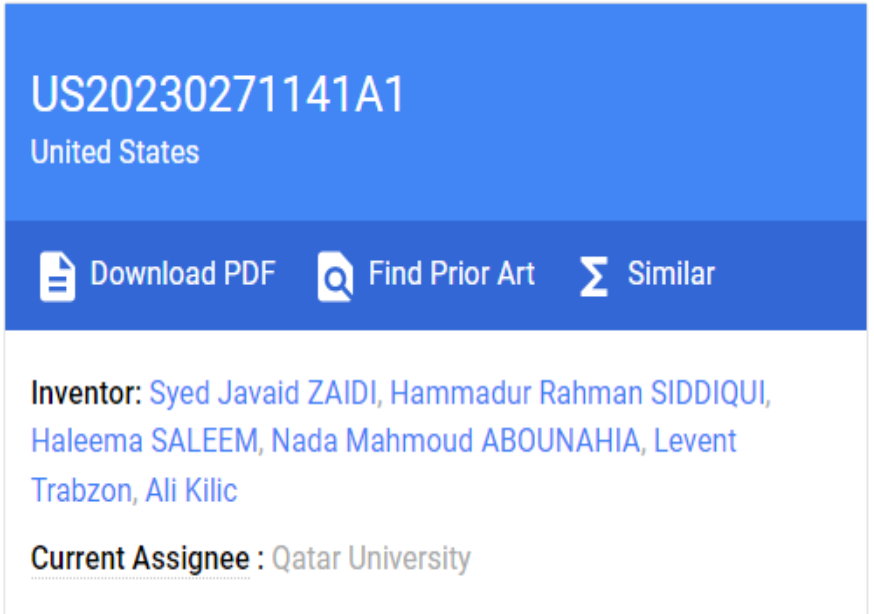
Qatar University (QU) Research - FO-Thermal Technologies Hybrid

Exploring Forward Osmosis (FO) as a Pretreatment for Thermal Seawater Desalination Plants.

- Advantages of FO:
  - Requires minimal energy due to osmotic pressure gradient.
  - Reversible fouling with less pretreatment requirements

Qatar-Based Research:

- FO demonstrated success in pretreating MSF plant's feed solution with a maximum membrane flux of 22.3 L/m2h.
- Combining FO with MSF increased the plant's production by 20% and reduced chemical costs.
- FO can allow safe operation of MSF at higher temperatures, resulting in increased unit capacity.

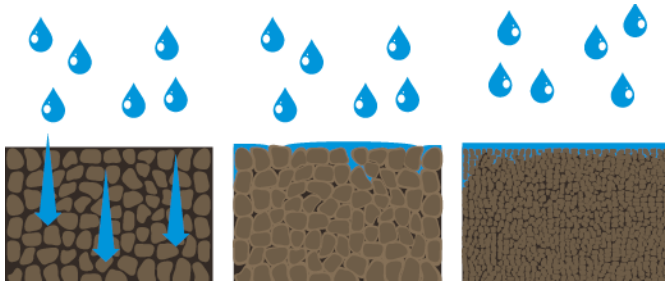


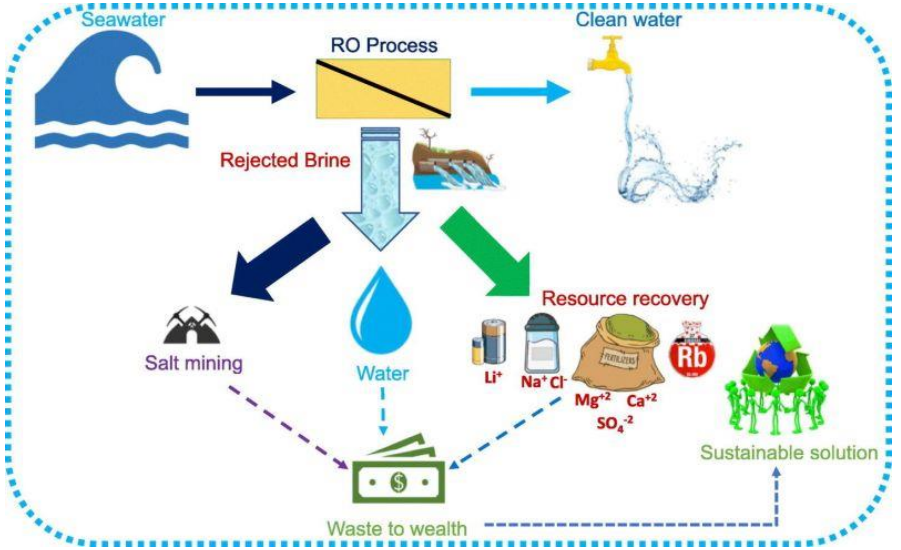
Topic : Ultrafast water flux through hot-pressed solution blown spun nanofiber-based thin film composite membranes for forward osmosis

Future Water Research Initiatives at Qatar University

Brine Management Initiative

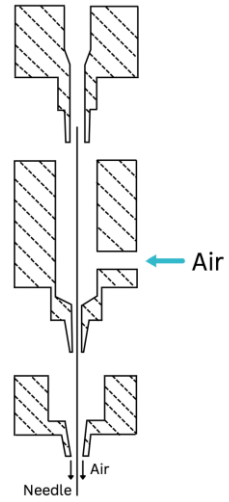
- Addressing the challenge of brine disposal from desalination plants
- Exploring brine treatment and valorization technologies
- Developing sustainable brine management strategies
- Developing attitude and habbit among local farms





Development of Nanostructured-Based Membranes:

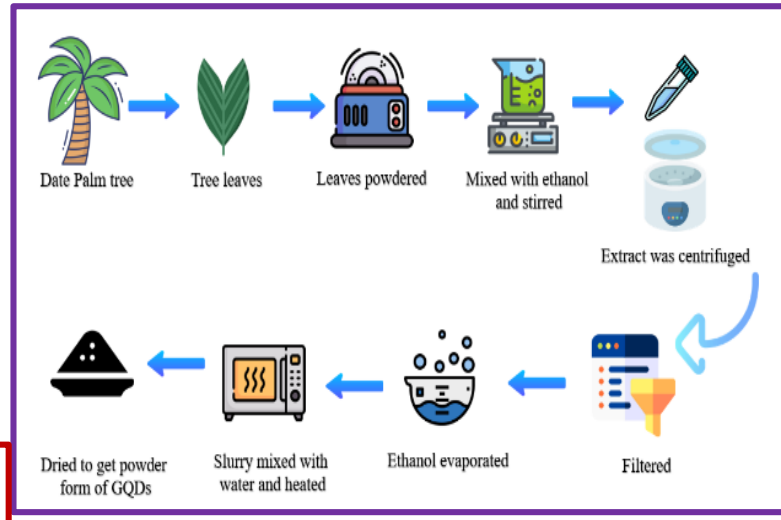
- Nanotechnology for advanced membrane design
- Enhanced membrane properties and performance
- Applications in water treatment and desalination



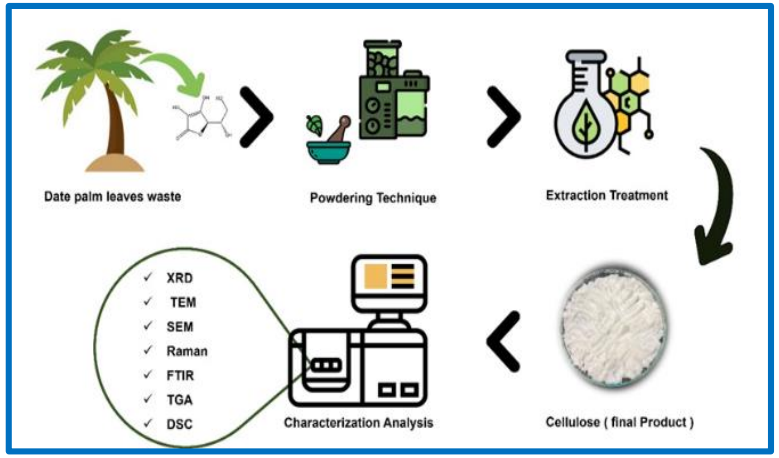
Future Water Research Initiatives at Qatar University

New Membrane Development Using Nanomaterials from Biowaste

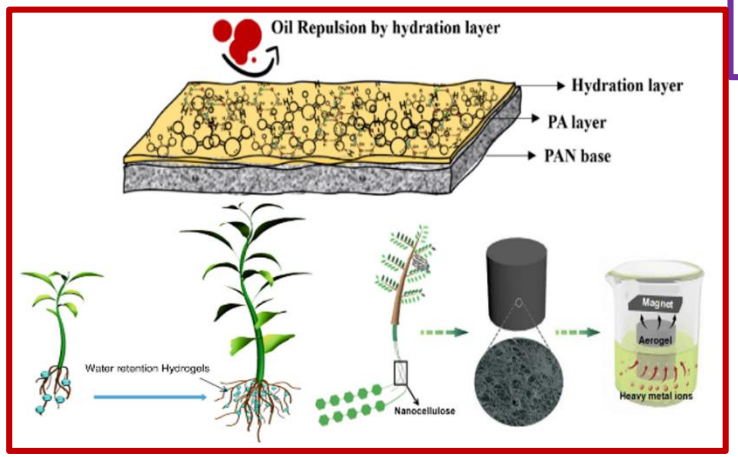
- Utilizing biowaste as a source of nanomaterials
- Developing high-performance and eco-friendly membranes
- Improving membrane efficiency and sustainability



Graphene quantum dots from date palm leaves



Cellulose from date palm leaves used for wastewater treatment.



Cellulose extraction from date palm leaves

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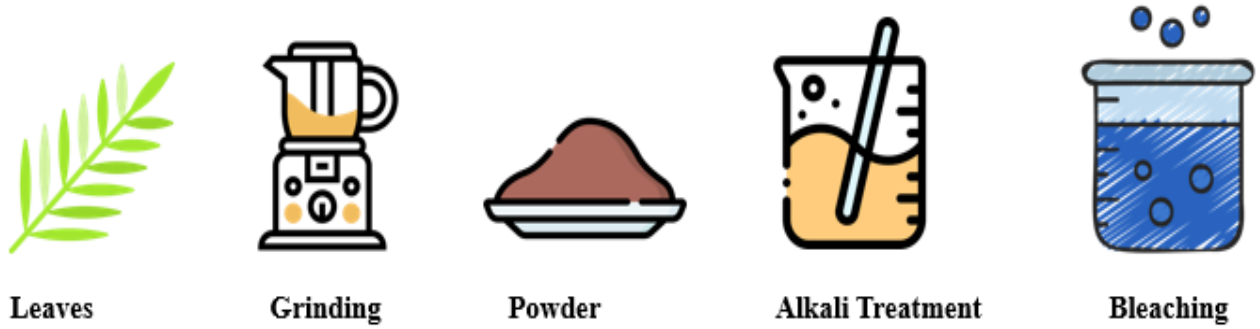
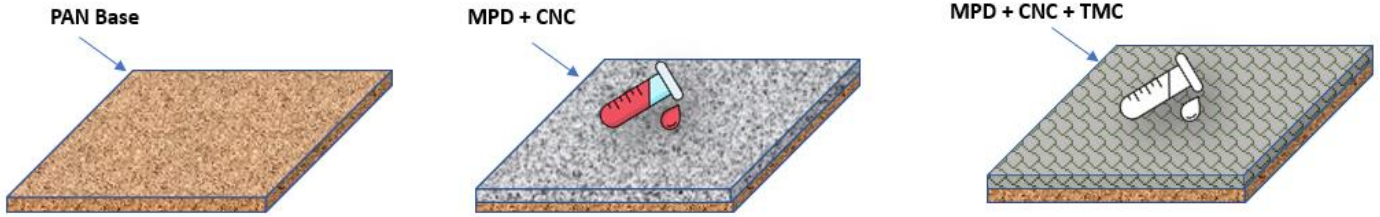
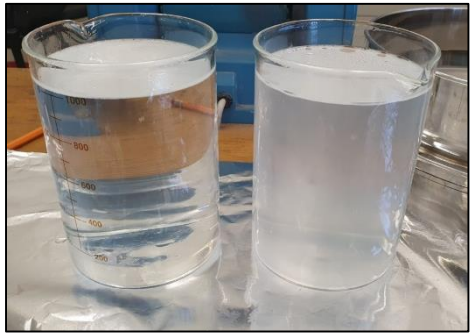


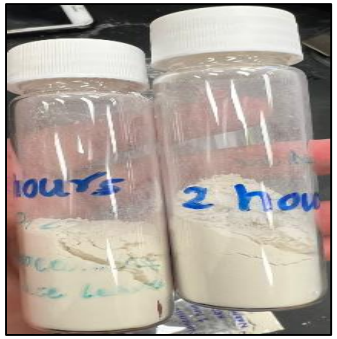
Schematic representation of cellulose extraction



Membrane modification for treating produced water



Synthetic PW



Cellulose nanocrystals (CNC)

Conclusion and Recommendations

- Water research crucial for sustainability in Qatar/GCC
- QU leads through specialized centers/initiatives
- Key areas: treatment, desalination, quality, water-energy nexus
- Innovative technologies for local climate/scarcity
- International collaborations foster impactful research
- Training and capacity building for skilled workforce
- Future initiatives: brine management, biowaste membranes, nanostructures
- Supports Qatar's vision for water security and sustainability

THANK YOU

For Further Information and Collaboration kindly contact Syed Javaid Zaidi
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