

STATE-OF-THE-ART NANOFILTRATION MEMBRANES WITH ADVANCED BIOPROCESSES FOR NEXT-GENERATION WASTEWATER MANAGEMENT, WATER RECLAMATION AND RESOURCES RECOVERY

Introduction:

Cutting-edge technologies are critical to Singapore's sustainable water management. This proposal addresses the need for a resilient urban water systems, with a focus on industrial and municipal wastewater treatment to strengthen Singapore's capacity for future demands and enhance resource recovery. Our approach integrates state-of-the-art membrane technology with advanced biological processes, namely Anammox–Feammox, and membrane bioreactors (MBR), to deliver holistic, cost-effective, and energy-efficient solutions. The core is the development of novel chemically resistant membranes to (1) demonstrate proof-of-concept integration with Anammox–Feammox for industrial wastewater treatment, and (2) enable high-TRL deployment of an enhanced MBR technology for municipal water reclamation.

Industrial Wastewater Objective

We aim to develop an integrated biotechnology–membrane–crystallization system for treating high-strength, inhibitory wastewaters (e.g., from anaerobic digester or sludge/food waste co-digester centrates) while recovering valuable resources such as phosphorus. This supports Singapore's efforts in sustainable sludge reuse and resource recovery. Key efforts include: (1) establishing a two-stage Anammox–Feammox process, (2) integrating with ion-selective, chemical-resistant nanofiltration (NF) membranes and fluidized bed crystallizers for simultaneous treatment and phosphorus recovery, and (3) reusing drinking water sludge as an iron source.

Municipal Wastewater Objective

Reclaimed water (NEWater) is vital to Singapore's water security but costly to produce, with current systems achieving only 75–85% recovery. Our goal is to increase recovery to $\geq 90\%$ while lowering costs. Key efforts include: (1) designing high-flux, pH-stable polymeric NF membranes operating at ~ 2 bar, (2) scaling up to 4-inch modules (TRL 6), (3) integrating NF modules with MBRs and downstream RO for higher recovery efficiency.

Strategic Alignment

While covering both industrial and municipal wastewater, our focus remains on integrating targeted biotechnologies with membrane systems to enhance existing solutions. This aligns with Singapore's priorities and complements the efforts of our Chinese collaborators, who are also working on industrial wastewater treatment, resource recovery, and municipal system improvements. The Singapore-China collaboration is expected to yield synergistic, scalable outcomes benefiting both partners.

THE SINGAPORE – CHINA JOINT FLAGSHIP PROJECT

刚刚，新加坡跟中国签署这6...

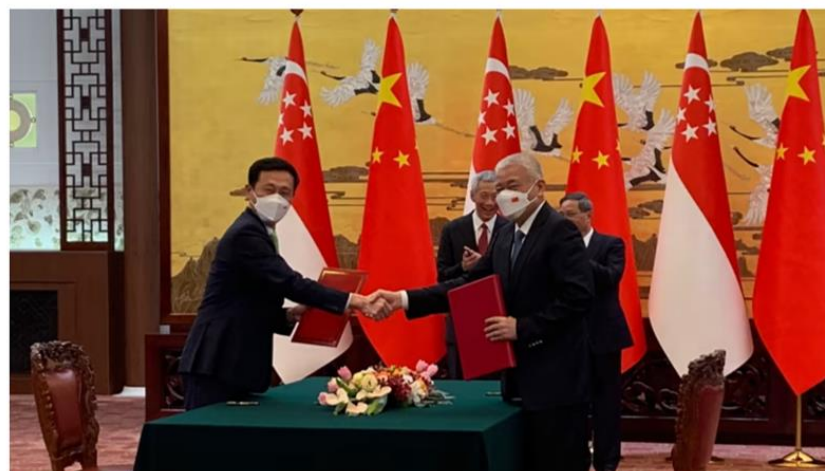
发布:01/04/2023 14:00 更新: 01/04/2023 14:29 ☆ 收藏

4) 新中双方将推展两个联合旗舰项目，培养两地科研人才！

在科研领域上，新中 双方将推展两个联合旗舰项目，促进在水和环境领域的研发合作、培养两地科研人才，并为两国科研能力建设做出贡献。

这两个项目，涵盖研发低碳节能海水淡化与资源回收的关键材料与技术，及开发最先进的纳滤膜与先进的生物工艺，用于下一代废水管理、水回收和资源回收。

新加坡国立大学和南洋理工大学，将分别同中国大学合作，进行开发工作。



我国和中国签署六个合作备忘录。（图：洪宝玲）



PI: Prof Wang Rong
Co-PIs: Prof Zhou Yan
Assoc Prof Chong Tzyy Haur

