

Thesis/Internship offer for a student in the field of chemical engineering /chemistry

<u>Topic:</u>	Fabrication of Nafion/crown ether composite membrane for selective removal of Na ⁺ using electro dialysis
<u>Start date:</u>	From March 2020 on (rather flexible, depending on the availability of the student)
<u>Duration:</u>	6-9 months
<u>Location:</u>	Wetsus, European centre of excellence for sustainable water technology, Leeuwarden (https://www.wetsus.eu)
<u>Salary:</u>	175 euros/month

Aim and approach

Nowadays, greenhouse irrigation water containing valuable nutrients, has often to be discharged to the environment as a brine stream. Reuse of water and nutrients would be enhanced if Na⁺ could be selectively removed from irrigation water. However, up to now there is still no cost-effective industrial technology that can selectively remove Na⁺. This project aims to develop a membrane-based material that can separate Na⁺ from the irrigation water meanwhile preserving other nutrients present, notably K⁺.

We will be focused on the fabrication of a composite membrane based on Nafion. The idea behind this approach is that the ion selective crown ether will either block or promote the transport of the target ion. Nafion membrane has been widely used in electro-membrane and fuel cell system and has good performance in cation transport. Therefore, Nafion will be impregnated into a membrane support in order to form a stable membrane. Na⁺ selectivity will be added by the addition of crown ether. Figure 1 summarizes brief procedure and machine used for membrane casting.

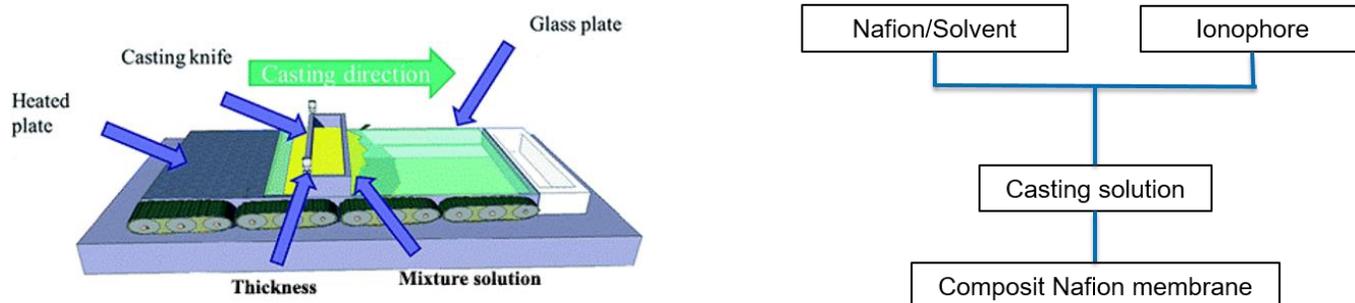


Figure 1. Possible membrane fabrication procedures

Opportunities for MSc thesis and Internship Students

Thesis work may include, i) the fabrication and characterization of the membrane and, ii), the functional characterization of the membrane using electro dialysis. Depending on the nature of research activities, the research will be conducted at Wetsus in Leeuwarden. The PhD research of Zexin Qian (PhD candidate at TU Delft and Wetsus) is performed in close collaboration with FujiFilm and WaterFuture, two companies linked to the Wetsus research program and desalination theme.

Technique to be used: Organic synthesis and the characterization of molecules (NMR, IR, possibly MS) and modified surfaces (XPS, IR, AFM) and the characterization/performance of membranes in electrical resistance, permselectivity and electro dialysis studies.

Application:

If you have any question do not hesitate to contact me. Candidates interested in this project are cordially invited to apply by sending CV and motivation letter to Zexin Qian at zexin.qian@wetsus.nl