

Research Project

1. Title of the project	Surface Modification of NF and RO Membranes by Layer by Layer Assembly	
2. Project partners/supervisors	Egypt	Germany
	Dr. Ahmed S. G. Khalil (FU/EGNC) Dr. Tarek A. GadAllah (NRC)	Prof. Dr. Mathias Ulbricht (UDE)
3. Profile of the master student	<ul style="list-style-type: none"> • Bachelor in Chemistry, Chemical Engineering, Materials Science or Pharmacy • Highly motivated and eager to learn • Follows the rules and guidelines set by the project partners 	
4. Duration of the project	12 months	
5. Work summary	<p>The project aims at the utilization of Layer by Layer (LbL) assembly for surface modification of membranes. The focus here will be on the nanofiltration and reverse osmosis membranes used for water purification and desalination. LbL will provide ultrathin charged layers on top of the desired membranes. The introduction of these functional surface groups will lead to more hydrophilic and high fouling resistance membranes. Prior to the LbL, surface charges must be introduced to the membranes enabling the formation of stable and controlled multilayers by LbL assembly. The optimization of the LbL preparation conditions will be crucial leading to membrane of high flux and rejection. In the second phase of the project, immobilization of nanoparticles on the charged membranes will be tested. The nanoparticles would introduce new functionality to the membranes as well as enhance the fouling resistance. The surface as well the structural properties of the prepared membranes will be characterized using techniques such as FTIR, XPS, contact angle, Zeta potential, SEM, and TEM.</p>	
6. Funding and resources available to complete the project	<p>At Fayoum University, different systems used for the preparation of ultrafiltration and RO membranes are available. Layer by Layer assembly can be used using custom setups. AFM is available at Egypt Nanotechnology Center. The other structural as well as surface characterizations are available at other labs in Egypt.</p>	<p>At UDE, characterization tools for surface, structural and transport properties of membranes such as FTIR, zeta potential, contact angle, permeability and SEM are available. Experimental setups needed for the preparation of membranes are also available.</p>
7. General impact of the project	<ul style="list-style-type: none"> • Transfer the know-how on using layer by layer assembly for surface functionalization of polymer nanocomposites membranes. • Functional and high fouling resistant membranes will be introduced. 	
8. Outlook of the project	<p>The proposed project will be part of the existing collaboration between the German and the Egyptian partners of the project on the development of efficient polymeric membranes used for water purification and desalination. Within the frame of this project, a detailed and extended proposal for extra funding will be prepared and submitted to funding programs in Germany and/or Egypt.</p>	