

**Sustainable Water Management
Doctoral Programme (Water4All)**



Title of the PhD Project	Removal of pesticides from water by using aquaporin-based biomimetic membranes
Acronym	ABM4PEST
Research Fields of the Project	Environmental Biotechnology, Environmental Microbiology
Keywords	Aquaporin, composite membrane, pesticide removal
Host Institution, Department and Campus Location	Gebze Technical University (GTU) Environmental Engineering Department
PhD Awarding Institution and Graduate Programme	Institute of Graduate Studies, GTU.
Name and Affiliation of Main Supervisor	Prof. Dr. Melek Özkan
Name and Affiliation of Co-Supervisors	Assoc. Prof. Dr. Hatice Eser Ökten
Research Environment and Infrastructure	The PhD Project will be held in the Biotechnology Laboratory of the Environmental Engineering Department of GTU. The Department has an adequate number of facilities in terms of equipment, expertise, and knowledge. Sophisticated instruments are available for use by department students, including ICP, GC, GC-MS, LC-MS, and HPLC. Also, the students can reach other facilities available at GTU's different departments. Environmental Engineering Department Biotechnology laboratory has all the necessary equipment for microbiological studies, including several shake incubators, autoclaves, laminar hood cabinet, small and large scale centrifuges, electrophoresis equipments, stop flow light scattering spectrometer and a dead-end reactor cell for membrane filtration experiments.
Scientific Context of the Project	Pesticides can reach water bodies due to the runoff from industrial effluent and agricultural fields. The presence of pesticides in water bodies lowers the availability of clean water for drinking and deteriorates the quality of the water. For pesticide removal, different conventional methods including coagulation-flocculation, adsorption, filtration, and sedimentation can be used. However, these techniques usually have high running costs and produce secondary pollutants. In recent years aquaporin-based membranes (ABMs) are being used for micropollutant removal

	<p>from different water sources. Aquaporins are integral membrane proteins facilitating the transport of water across the lipid bilayer of living organisms. They have high water transport efficiency and they can reject various compounds including organic and inorganic substances. Biomimetic membranes prepared by incorporation of aquaporins (ABM) have generally been used for improving the water filtration capacity of forward and reverse osmosis filtration membranes. <i>Escherichia coli</i> AqpZ is by far the most commonly used aquaporin in desalination membranes. <i>Halomonas elongata</i> Aqp cloned and characterized in our laboratory was also used for composite membrane preparation. New usage areas of ABMs include dewatering, greywater treatment, wastewater treatment, and micro pollutant removal. In this Project, aquaporin-based composite thin film membranes will be prepared and tested for removal of different pesticides from water.</p>
Brief Workplan	<p>Aquaporins that are already cloned in <i>E. coli</i> will be produced, purified, and used for aquaporin-based thin film composite membrane preparation. The effect of aquaporin concentration, the concentration and type of ingredients of the composite matrix, and the use of different membrane supports on the removal of various pesticides by ABMs will be investigated in the project.</p>
Innovative Aspects of the Project	<p>ABMs strengthen the permeate flux, solute selectivity, and anti-fouling capability of filtration membranes. In this project, an environmentally friendly way of pesticide removal will be investigated and its potential will be revealed. The use of novel aquaporins and testing ABM for the removal of different types of pesticides from water will increase the applicability potential of aquaporin-based filtration membranes.</p>
Training Opportunities of the Project	<p>The student will be supported in joining symposia and workshops on membrane technologies. The student also can join the lectures and seminars on wastewater treatment and membrane processes available at GTU Environmental Engineering Department.</p>
Interdisciplinary Aspects	<p>The project involves knowledge and methods of both environmental engineering and microbiology.</p>
<p>Intersectoral Mobility</p> <p><input type="checkbox"/> Short Visit</p> <p><input type="checkbox"/> Secondment</p>	<p>TBD</p>



Intersectoral Mobility <input type="checkbox"/> Short Visit <input type="checkbox"/> Secondment	TBD
International Academic Secondment	Consiglio Nazionale delle Ricerche Istituto per la Tecnologia delle membrane, Italy

Main Supervisor										
Brief CV	<p>Prof. Dr. Melek ÖZKAN</p> <p>E-mail: mozkan@gtu.edu.tr</p> <p>Academic Degrees</p> <table><tr><td>Ph.D.</td><td>Biotechnology, Middle East technical University, Türkiye</td><td>2002</td></tr><tr><td>M.Sc.</td><td>Biotechnology, Middle East technical University, Türkiye</td><td>1997</td></tr><tr><td>B.Sc.</td><td>Biology, Middle East Technical University, Türkiye</td><td>1994</td></tr></table> <p>Professional Networks</p> <p>Google Scholar: https://scholar.google.com/citations?user=prMIR9sAAAAJ&hl=en&oi=ao</p> <p>ResearchGate: https://www.researchgate.net/profile/Melek-Ozkan</p> <p>Scopus: https://www.scopus.com/authid/detail.uri?authorId=8850020000</p> <p>ORCID: https://orcid.org/0000-0001-9017-5389</p>	Ph.D.	Biotechnology, Middle East technical University, Türkiye	2002	M.Sc.	Biotechnology, Middle East technical University, Türkiye	1997	B.Sc.	Biology, Middle East Technical University, Türkiye	1994
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Brief CV	<p>Assoc. Prof. Dr. Hatice Eser ÖKTEN</p> <p>Email: haticeokten@iyte.edu.tr</p> <p>Academic Degrees:</p> <table><tr><td>Ph.D.</td><td>University of Wisconsin-Madison, Madison, Wisconsin, USA</td><td>2008</td></tr><tr><td>M.Sc.</td><td>İstanbul Technical University, Türkiye</td><td>2002</td></tr><tr><td>B.Sc.</td><td>İstanbul University, Türkiye</td><td>1999</td></tr></table> <p>Professional Networks</p> <p>Google Scholar: https://scholar.google.com.tr/citations?user=GLVckPMAAAAJ&hl=en</p> <p>ResearchGate: https://www.researchgate.net/profile/Hatice-Eser-Oekten</p> <p>Scopus: https://www.scopus.com/authid/detail.uri?authorId=12776514500&origin=recordpage</p> <p>ORCID: https://orcid.org/0000-0001-7511-940X</p>	Ph.D.	University of Wisconsin-Madison, Madison, Wisconsin, USA	2008	M.Sc.	İstanbul Technical University, Türkiye	2002	B.Sc.	İstanbul University, Türkiye	1999
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