**Sustainable Water Management**

**Doctoral Programme (Water4All)**

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| **Title of the PhD Project** | Treatment of soft juice industry wastewater for efficient bioethanol production |
| **Acronym** | WASTE2FUEL |
| **Research Fields of the Project** | Environmental Biotechnology, Environmental Microbiology |
| **Keywords** | bioethanol, fermentation, wastewater |
| **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 types of equipment for microbiological studies, including several shake incubators, autoclaves, laminar hood cabinet, small and large-scale centrifuges, and electrophoresis equipments. |
| **Scientific Context of the Project** | Energy is one of the most important needs of the World today. Most of the World's energy is provided by fossil fuels such as petroleum or coal whose reserves are limited. The greenhouse effect and contribution to climate change is another problem of fossil fuels, therefore there is a remarkable number of research on finding suitable renewable and green energy sources and technology development. Utilization of industrial waste and wastewater for biofuel production is regarded as a promising solution to decrease the cost of feedstock and pretreatment steps and |

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| | increase competition of bioethanol with fossil fuels.<br><br>In this Project, soft juice industry wastewater, which is rich in sugar and cellulose, will be used for ethanol production by fermentation process. For ethanol fermentation, ethanol-producing yeasts and bacteria will be tested for their adaptability to wastewater conditions and the conditions for increasing their ethanol production efficiency from wastewater will be optimized. |
| **Brief Workplan** | Industrial wastewater will be collected and solid and liquid phases will be separated for characterization (total C, N, P content, COD and MLSS determination, cellulose and sugar content, inorganic ions, and metal content). Treatment of the solid phase and determination of the utilization potential of solid and liquid phases of wastewater as a carbon source for bioethanol fermentation by three different ethanol-producing microorganisms will be achieved by lab-scale experiments. The presence of inhibitory substances in the wastewater and their effect on bioethanol production will be analyzed. The potential of the selected wastewater to be used for ethanol production in an automated fermenter will be investigated and the process will be modeled for applicability for large-scale production. |
| **Innovative Aspects of the Project** | Although many types of industrial wastewater have high carbon and nitrogen content they are not recycled and utilized for biorefineries. Bioethanol production efficiency of different ethanol-producing microorganisms from wastewater will present the difference in the tolerance of these microorganisms to harsh characteristics of wastewater. |
| **Training Opportunities of the Project** | The student will be supported in joining symposia and workshops on renewable energy and fermentation technologies. The student also can join the lectures and seminars on renewable energy, wastewater treatment, and fermentation technologies available at GTU Environmental Engineering Department and other departments suitable for interdisciplinary studies. |
| **Interdisciplinary Aspects** | The project involves knowledge and methods of both environmental engineering and microbiology. |
| **Intersectoral Mobility**<br><br>☐ **Short Visit**<br><br>☐ **Secondment** | TBD |

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| **Intersectoral Mobility**<br>☐ **Short Visit**<br>☐ **Secondment** | TBD |
| **International Academic Secondment** | Universitat für Bodenkultur Wien |

| **Main Supervisor** | |
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| **Brief CV** | **Prof. Dr. Melek ÖZKAN**<br>**E-mail:** mozkan@gtu.edu.tr<br>**Academic Degrees**<br>Ph.D. Biotechnology, Middle East technical University, Türkiye 2002<br>M.Sc. Biotechnology, Middle East technical University, Türkiye 1997<br>B.Sc. Biology, Middle East Technical University, Türkiye 1994<br>**Professional Networks**<br>Google Scholar:<br>https://scholar.google.com/citations?user=prMlR9sAAAAJ&hl=en&oi=ao<br>ResearchGate:<br>https://www.researchgate.net/profile/Melek-Ozkan<br>Scopus:<br>https://www.scopus.com/authid/detail.uri?authorId=8850020000<br>ORCID:<br>https://orcid.org/0000-0001-9017-5389 |
| **Co-supervisors** | |

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| **Brief CV** | **Assoc. Prof. Dr. Hatice Eser ÖKTEN**<br><br>**Email:** haticeokten@iyte.edu.tr<br><br>**Academic Degrees:**<br><br>Ph.D. University of Wisconsin-Madison, Madison, Wisconsin, USA 2008<br><br>M.Sc. İstanbul Technical University, Türkiye 2002<br><br>B.Sc. İstanbul University, Türkiye 1999<br><br>**Professional Networks**<br><br>Google Scholar:<br><br>https://scholar.google.com.tr/citations?user=GLVckPMAAAAJ&hl=en<br><br>ResearchGate:<br><br>https://www.researchgate.net/profile/Hatice-Eser-Oekten<br><br>Scopus:<br>https://www.scopus.com/authid/detail.uri?authorId=12776514500&origin=recordpage<br><br>ORCID:<br><br>https://orcid.org/0000-0001-7511-940X |