Sustainable Water Management

Doctoral Programme (Water4All)

Title of the PhD Project	Immobilization of layered double hydroxides on supports as reusable catalysts for degradation of refractory organic pollutants using advanced oxidation processes
Acronym	Immobilized catalysts
Research Fields of the Project	Nanoscience, Nanocatalysts Synthesis, Photocatalytic processes
Keywords	Refractory pollutants, Nanotechnology, Fixed catalysts, Ultrasonic Emerging pollutants, Doping, Photocatalysis, Sonocatalysis, Water treatment
Host Institution, Department and Campus Location	Department of Chemical Engineering, Istanbul Technical University, Maslak, 34469 Istanbul, Turkey
PhD Awarding Institution and Graduate Programme	Istanbul Technical University, PhD in Chemical Engineering
Name and Affiliation of Main Supervisor	Prof. Dr. Alireza Khataee Department of Chemical Engineering & Nano Science and Nano Engineering Department, Istanbul Technical University, Maslak, 34469 Istanbul, Turkey
Name and Affiliation of Co-Supervisors	Doç. Dr. Hatice Eser Ökten Department of Environmental Engineering, Izmir Institute of Technology, Izmir, Turkey Prof. Dr. Mustafa M. Demir

	Department of Material Science and Engineering, Izmir Institute of Technology, Izmir, Turkey
Research Environment and Infrastructure	Istanbul Technical University (ITU) and Izmir Institute of Technology have all the facilities for synthesizing, characterizing, and testing nanomaterials and layered catalysts. These facilities include: (I) for synthesis: precursors, solution-based and hydrothermal synthesis facilities; (II) for AOPs applications: ultrasonic baths and probes, different light sources; and (II) for characterization: XRD, SEM-EDX, BET, RAMAN, DRS, ICP, Spectrophotometers, GCMS. The TEM and XPS are available at service laboratories. During the visit to Zhejiang Normal University in China, the candidate will also have access to advanced laboratories for preparing nanomaterials and their characterization equipments.
Scientific Context of the Project	The project deals with the synthesis and immobilization of layered double hydroxides. Some layered double hydroxides would be synthesized and then immobilized on supports to design reusable catalysts. The immobilized catalysts will be used in the degradation of refractory organic pollutants.
Brief Workplan	(1 year) Literature review and design of experimental setups (1 year) Synthesis, immobilization, and characterization of layered double hydroxides (1 year) Application of immobilized layered double hydroxides in the advanced oxidation processes (1 year) Study the main parameters and the reusability of the catalysts
Innovative Aspects of the Project	The project deals with state-of-the-art novel approaches to the synthesis and immobilization of layered double hydroxides to reach the reusable catalysts
Training Opportunities of the Project	The doctoral candidates will be trained on the various approaches for designing reusable nanocatalysts to degrade refractory organic pollutants. They will be trained on nanomaterials characterization instruments such as TEM, SEM, XRD, XPS, and BET. In addition, students will be trained in advanced oxidation processes such as photocatalysis, sonocatalysis, Fenton-based processes, and electrochemical processes. During the visit to Zhejiang Normal University in China, the candidate will

	also have access to advanced laboratories for preparing nanomaterials and their characterization equipments.
Interdisciplinary Aspects	A professional team will implement the project gathered from academicians in the fields of nanoscience & nanoengineering, chemical engineering, and environmental engineering.
Intersectoral Mobility **☐ Short Visit** **☐ Secondment**	TBD
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International Academic Secondment	Host Supervisor: Prof. Yasin Orooji Host Institution: Zhejiang Normal University, China Host Department: College of Geography and Environmental Sciences Duration: 6-12 months Estimated Time of Mobility: 2nd or 3rd year of the project

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

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Brief CV	**Prof. Dr. Mustafa M. DEMİR** **E-mail:** mdemir@iyte.edu.tr **Academic Degrees** Ph.D. Materials Sciences and Engineering, Sabancı University, Türkiye 2004 M.Sc. Materials Sciences and Engineering, Sabancı University, Türkiye 2001 B.Sc. Chemistry, Boğaziçi University, Türkiye 1999 **Professional Networks** Google Scholar: https://scholar.google.com/citations?user=OX8Cq2wAAAAJ&hl=en ResearchGate: https://www.researchgate.net/profile/Mustafa-Demir-10 Scopus: https://www.scopus.com/authid/detail.uri?authorId=13907034500 ORCID: https://orcid.org/0000-0003-1309-3990