

Project abstract

The wastewater generated from different point sources (domestic and urban runoffs) contains a variety of pollutants including contaminants of emerging concern (CECs), pathogenic bacteria and resistant genes. CECs are referred to a group of natural or synthetic chemical substances that have been detected in environmental monitoring samples, that may cause ecological or human health impacts and typically are not regulated under current environmental laws. Domestic sewage is one of the major sources of containing distinctive CECs at elevated concentration. Pathogens are biological agents typically found in urban wastewater. The risk associated with pathogens in urban wastewater is difficult to estimate because of their invisibility in the water matrix. The existing urban wastewater treatment plants are not designed for removal of CECs and pathogenic bacteria.

In recent years, carbon-based catalyst such as biochar has been extensively studied photocatalyst in combination with peroxymonosulfate (PMS), persulfate (PS) and H_2O_2 for degradation of wide range of target CECs. Compared to UV driven AOP, biochar based AOP offer several advantages because of its environmentally friendly and abundance availability in nature. Biochar can be obtained from pyrolysis of a wide variety of biomass feedstock including wheat straw, corn cob, rice husk, peanut shells, potato waste residue, and wood chips. Despite the fact that biochar coupled to has been widely investigated for removal of CECs from urban wastewater, simultaneous removal of CECs and bacteria by biochar/oxidant has been rarely reported in the scientific literature. Moreover, the environmental impacts of biochar/oxidant compared to other AOPs/conventional treatment process through life cycle assessment has not been done so far.

The aim is to investigate the efficiency of biochar as a catalyst coupled with PMS for simultaneous removal of CECs and bacteria in real urban wastewater. The results obtained will be compared with other AOPs in particular to solar photo-Fenton process and conventional treatment method applied at full scale i.e., ozonation. The life cycles assessment of biochar/oxidant system will be conducted to comprehensively evaluate the environmental impact of the treatment with regard to construction, deconstruction, energy, chemical and materials involved in the treatment and compare with conventional and other AOPs.

Contact details:

Name: Mister Adeel

Email: madeel@unisa.it

Current affiliation: University of Salerno (postdoc)

PERSONAL INFORMATION



Mister Adeel

📍 Department of Civil Engineering, University of Salerno, Italy

✉ detho.adeel@yahoo.com

✉ dethoadeel@sjtu.edu.cn

✉ madeel@unisa.it

Sex Male | Date of birth 18/07/1993 | Nationality Pakistani

WORK EXPERIENCE

Sep. 2019 – Dec. 2021

Research Assistant

Quaid-e-Awam University, Nawabshah, Pakistan

- Assisted professor with lab work, courses and manuscript write up.

March 2024 – Sep. 2024

Research Internship

Plataforma Solar de Almería (PSA), Spain

- Research activities carried out during the stay include treatment of real urban wastewater containing wastewater via different treatment methods (solar photo-Fenton and biochar) and determined post-treatment effects on microplastics.

Feb 2025 – till now

Post-doc Researcher

- University of Salerno

EDUCATION AND TRAINING

Jan. 2022 – Dec. 2024

Doctor of Civil Engineering

University of Salerno, Italy

- Major courses include Probability and Statistics, Sustainability in Civil Engineering, etc.,

Sep. 2016 – Mar. 2019

Master of Environmental Science and Engineering

Shanghai Jiao Tong University, Shanghai, China

CGPA obtained **3.39/4.0 (Equivalent to 84%)**

- Major courses include Environmental studies, Mathematics, Environmental Chemistry, Chinese Language and Culture etc.

Jan. 2012 – Dec. 2015

Bachelor of Civil Engineering

Quaid-e-Awam University of Engineering Science and Technology, Nawabshah, Pakistan

CGPA obtained **3.83/4.0 (Equivalent to 83.33%)**

- Major courses include Engineering Structures, Design, Transportation, Management etc.

Language(s)

English (IELTS 6.5), Italian (basic), Spanish (basic), Chinese (basic), Urdu (mother tongue)

Social connections

ResearchGate
LinkedIn

<https://www.researchgate.net/profile/Mister-Adeel>
<https://www.linkedin.com/in/mister-adeel-434194109/>

Publications

Mister Adeel, Carla Fernanda Grasel Frois, Ilaria Berruti, Carla Sirtori, Isabel Oller, Sixto Malato, Luigi Rizzo, Effect of microplastics on tertiary/quaternary treatment of urban wastewater: Fe-Biochar/PMS/sunlight Vs Solar photo-Fenton, *Journal of Environmental Management*, 384 (2025), 125555. doi.org/10.1016/j.jenvman.2025.125555

Mister Adeel, Carla Fernanda Grasel Frois, Ilaria Berruti, Carla Sirtori, Sixto Malato, Luigi Rizzo, Activation of peroxymonosulfate by(sunlight)FeCl₃-modified biochar for efficient degradation of contaminants of emerging concern: Comparison with H₂O₂ and effect of microplastics, *Chemical Engineering Journal*, 507 (2025), 160782. doi.org/10.1016/j.cej.2025.160782

Mister Adeel, Claudia Cirillo, Maria Sarno, Luigi Rizzo, Urban wastewater disinfection by FeCl₃-activated biochar/peroxymonosulfate system: *Escherichia coli* inactivation and microplastics interference, *Environmental Pollution*, 359 (2024), 124607. doi.org/10.1016/j.envpol.2024.124607

Mister Adeel, Theoni Mina, Luigi Rizzo, Despo Fatta-Kassinos, The impact of microplastics on the efficacy of urban wastewater treatment processes, *Journal of Environmental Chemical Engineering*, 12 (2024), 113625. doi.org/10.1016/j.jece.2024.113625

Mister Adeel, Veronica Granata, Giovanni Carapella, Luigi Rizzo, Effect of microplastics on urban wastewater disinfection and impact on effluent reuse: Sunlight/H₂O₂ vs solar photo-Fenton at neutral pH, *Journal of Hazardous Materials*, 465 (2024), 133102. doi.org/10.1016/j.jhazmat.2023.133102

Mister Adeel, Gulnara Maniakova, Luigi Rizzo, Tertiary/quaternary treatment of urban wastewater by UV/H₂O₂ or ozonation: Microplastics may affect removal of *E. coli* and contaminants of emerging concern, *Science of the Total Environment*, 907 (2024), 167940. doi.org/10.1016/j.scitotenv.2023.167940

Mister Adeel, Extractive membrane bioreactor (EMBR) for industrial wastewater treatment: From theory to practice, *Bioresource Technology Reports*, 26 (2024), 101846. doi.org/10.1016/j.biteb.2024.101846

Mister Adeel, Yubo Xu, Long-Fei Ren, Jiahui Shao, Yiliang He, Improvement of phenol separation and biodegradation from saline wastewater in extractive membrane bioreactor (EMBR), *Bioresource Technology Reports*, 17 (2022), 100897. doi.org/10.1016/j.biteb.2021.100897

Mister Adeel, Long-Fei Ren, Jun Li, Jiahui Shao, Ahmed Jawad, Chen Su, Yumei Wang, Li Guo, Yiliang He, Improved/enhanced Mechanical strength of PDMS/PMMA composite nanofiber membrane using MWCNTs and its application in phenol separation and salt rejection, *Journal of Applied Polymer Science*, 136 (2019), 47123. doi.org/10.1002/app.47123

Long-Fei Ren, **Mister Adeel**, Jun Li, Cong Xu, Zheng Xu, Xiaofan Zhang, Jiahui Shao, Yiliang He, Phenol separation from phenol-laden saline wastewater by membrane aromatic recovery system-like membrane contactor using superhydrophobic/organophilic electrospun PDMS/PMMA membrane, *Water Research*, 135 (2018), 31-43. doi.org/10.1016/j.watres.2018.02.011

Jun Li, Long-Fei Ren, Jiahui Shao, **Mister Adeel**, Yonghui Tu, Zhongbao Ma, Yiliang He, Effect of ionic liquid on the structure and desalination performance of PVDF-PTFE electrospun membrane, *Journal of Applied Polymer Science*, 137 (2020), 48467. doi.org/10.1002/app.48467

- Projects

PhD Thesis: Interference of microplastics on tertiary/quaternary treatment of urban wastewater

Summary: Climate change, over population and industrialization have brought water scarcity issue throughout the world. Reuse of wastewater (reclaimed water) for purposes like irrigation and recreational activities is the best alternative to reduce the risk of water shortage problem. During my PhD study, I worked on the advanced oxidation processes namely UV/H₂O₂, solar photo-Fenton, ozonation, and biochar/oxidant based treatments to investigate the potential effects of microplastics on removal of contaminants of emerging concerns (CECs) and disinfection (bacterial inactivation). The findings from the study suggested that presence of microplastics in urban wastewater reduced disinfection performance by attaching bacteria on their surface, blocking/scattering effect of sunlight and consumption of radicals generation, eventually shielding bacteria from inactivation. On the other hand, CECs degradation in presence of microplastics improved due to adsorption of pollutants on MPs surface.

Master Thesis: Fabrication of Novel Electrospun PDMS/PMMA/MWCNTs Composite Membrane and its Application in Wastewater Treatment

Summary: Membrane technology has gained much popularity over the past few decades for the treatment of water and wastewater. The main aim of this research was to fabricate polymeric membrane to separate organic and inorganic pollutants from synthetic polluted water. To fabricate membrane, electrospinning techniques were employed. Phenol and salt were used as organic and inorganic impurities to be used as pollutants in water. Membrane aromatic recovery system (MARS) was used for phenol separation and salt rejection. While a lab scale extractive membrane bioreactor was designed to further degrade the contaminant. Results indicated that the phenol permeation efficiency of fabricated membrane was 34.5% higher than the commercial one with a salt rejection of 99.97%. The probable reason for increased phenol separation efficiency using MWCNTs was the adsorption/desorption capability of MWCNTs that helped to accelerate the diffusion process more quickly.

- Reviewed for Journals

Journal of Environmental Chemical Engineering, Elsevier (19)

Environmental Pollution, Elsevier (1)

Heliyon, Elsevier (2)

Radiation physics and Chemistry, Elsevier (2)

Environmental Science and Engineering, Springer (1)

- References

Prof. Dr Luigi Rizzo, University of Salerno, Italy, e-mail: l.rizzo@unisa.it

Prof. Dr Sixto Malato Rodriguez, Plataforma Solar de Almería-CIEMAT, Spain, e-mail: smalato@psa.es

Prof. Dr Despo Fatta-Kassinos, University of Cyprus, e-mail: fatta-kassinos.despo@ucy.ac.cy

Prof. Dr Shao Jiahui, Shanghai Jiao Tong University, China, e-mail: jhshao@sjtu.edu.cn

- Certifications/summer school

Best Poster Award (4th European School on Environmental Applications for AOPs, Greece, 2024)

Introduction to Household Water Treatment and Safe Storage (5 weeks online course)

Planning and Design of Sanitation Systems & Technologies (5 weeks online course)

Global Environmental Management (5 weeks online course)

Chinese for HSK 1 (7 weeks online course)

Water Reuse, Summer School, Torino, Italy, 2023 (1 week)

- Soft skills

Life cycle assessment (LCA), SimaPRO

Python programming