



Nowelties
European Joint Doctorate



Nowelties' Final Conference

*New Materials and Inventive Waste Water Treatment Technologies.
Harnessing resources effectively through innovation*

11-12 May, 2022

Workshop What after Nowelties?

13 May 2022

Inter-University Centre Dubrovnik, CROATIA



Organized by



University of Zagreb
Faculty of Chemical
Engineering and Technology



OBJECTIVES

NOWELTIES is a MSCA European Joint Doctorate (EJD) that provides cutting edge training opportunities for the education of tomorrow's water treatment experts. The main objective of the Final Conference is to present the results of NOWELTIES' research program, as well as new achievements in the field of the development and application of new materials and inventive processes for waste water treatment, with specific emphasis on the technologies able to control contamination by organic micropollutants (OMPs) and therefore help overcoming barriers for water reclamation.

Conference will present some recent technological and methodological developments that offer a range of opportunities for transitioning to smart water management and adopting treatment approaches capable of significantly enhancing the degradation of OMPs, whilst exhibiting a low energy footprint and residual stream.

The Conference is not limited to NOWELTIES members, but it is open for a wide scientific community, industry and end users.

TOPICS COVERED

Advances in biological treatment of WW

Biological treatment systems contain a variety of active microorganisms and may operate under different redox conditions. Consequently, there is huge versatility of designs and operations whose optimization may lead to an improvement in process efficiency. The key for optimization lies in the understanding of different biotransformation mechanisms and deciphering of the immense number of enzymatic routes involved in the different biological wastewater treatments.

Progress in advanced oxidation processes (AOPs)

Some oxidative wastewater treatments (i.e., ultraviolet (UV)/hydrogen peroxide (H₂O₂) treatment, ozonation (O₃), photo-Fenton) have reached a high level of development and have been commercialized. Further improvements are focused on the optimization of operational performances, reactor designs and utilization of new technological developments to increase their efficiency. On the other hand, some AOPs are still at the stage of laboratory research or are merely proof-of-concept. One of the most promising AOPs is based on the use of non-thermal plasma to produce H₂O₂, molecular oxygen and hydrogen, and hydroxyl, hydroperoxyl, atomic hydrogen and oxygen, as well as other radicals. Although shown to rapidly and efficiently degrade many organic compounds, little is known about the feasibility of plasma treatment for the removal of more recalcitrant

compounds from wastewater or regarding their degradation kinetics and energy efficiency, as well as degradation by-products generated and their toxicity.

New materials and application of nanotechnology in WW treatment

Novel (nano)engineered materials, such as (nano)adsorbents, composite membranes and(photo)catalysts are very promising candidates for the development of next generation treatment technologies. Generally, they exhibit various merits, such as high capacities, fast kinetics, specific affinity towards targeted contaminants, enhanced photocatalytic response for a broad light spectrum, and strong anti-bacterial activity. The field of their application is extremely wide and some examples include carbon tubes, fullerene derivatives, graphene-based materials (graphene, graphene oxide and reduced graphene oxide), functionalized zeolites, fibers with core shell structure, nano metals or metal oxides.

Hybrid WW treatments

Combining biological processes with innovative physico-chemical processes employing novel (nano) engineered materials and/or next-generation integrated membrane processes establishes multiple barriers towards a wide range of different OMPs that should also be effective against microbial contaminants (i.e., viruses, antibiotic resistant bacteria or antibiotic resistance genes) as well as remove residual nutrients. Such high performing and compact hybrid systems will also offer new opportunities to establish robust concepts for decentralized wastewater treatment facilitating local water reclamation and reuse.

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CONFERENCE PROGRAMME

INVITED SPEAKERS

Christa McArdell, EAWAG, Duebendorf, Switzerland

Alette Langenhoff, Wageningen University, the Netherlands

Urska Lavrenčič Štangar, University of Ljubljana, Slovenia

Adrian M.T. Silva, University of Porto, Portugal

Jörg Drewes, Technical University of Munich, Germany

PROGRAMME

Wednesday, 11th May 2022

9:00 – 10:00 Registration

10:00 – 10:15 Welcome

10:15 – 11:00 **Christa McArdell**, EAWAG, Duebendorf, Switzerland

The implementation of advanced wastewater treatment in Switzerland

Session 1. Advances in biological treatment of wastewater

11:00 – 11:30 **Alette Langenhoff**, Wageningen University, the Netherlands

Biological treatment technologies for the removal of micropollutants

11:30 – 12:00 Poster session / Coffee break

12:00 – 12:30 **Silvana Quiton**, University of Santiago de Compostela, Spain

Supervisors: Francisco Omil, Andreas Schaeffer, Sonia Suarez

Removal of antibiotics in different anoxic systems. Comparisons between heterotrophic and autotrophic denitrifying systems for antibiotic removal

12:30 – 13:00 **Ana Paulina López**, RWTH Aachen University, Germany

Supervisors: Andreas Schaeffer and Juan Lema

Thresholds for microbial degradation of wastewater contaminants: relationship between bioavailability and the onset of biodegradation

13:00 – 13:30 **Edwin Antonio Chingate**, Technical University of Munich, Germany

Supervisors: Jörg E. Drewes, Uwe Hübner, Maria Jose Farre

Transformation of sulfamethoxazole and atenolol by bacterial communities adapted to aniline, histidine, and succinate

13:30 – 15:00 Lunch

Session 2: Progress in advanced oxidation processes (AOPs)

- 15:00 – 15:30 **Urska Lavrenčič Štangar**, University of Ljubljana, Slovenia
The effect of (waste)water matrix on photocatalytic degradation of pharmaceuticals
- 15:30 – 16:00 **Amit Kumar**, Institute of Physics Belgrade, Serbia
Supervisors: Nevena Puac, Wolfgang Gernjak
Wastewater treatment by using cold atmospheric plasma
- 16:00 – 16.30 **Barbara Topolovec**, Catalan Institute for Water Research (ICRA), Girona, Spain
Supervisors: Mira Petrovic, Paola Verlicchi, Nevena Puac
Degradation and study of transformation products of per- and polyfluorinated alkyl substances (PFAS) during plasma treatment
- 16:30 – 17:00 Poster session / Coffee break
- 17:00 – 17:30 **Danilo Bertagna**, Faculty of Chemical Engineering and Technology (FKIT), University of Zagreb, Croatia
Supervisors: Sandra Babic, Gianluigi Buttiglieri
Application of UV-LEDs AOPs for the efficient removal of OMPs from water
- 18:00 Welcome party and dinner

Thursday, 12th May 2022

Session 3: New materials and application of nanotechnology in wastewater treatment

- 10:00 – 10:30 **Adrian M.T. Silva**, University of Porto, Portugal
Carbon materials as catalysts in AOPs for water/wastewater treatment
- 10:30 – 11:00 **Camilo Sánchez**, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb
Supervisors: Lidija Curkovic, Davor Ljubas, Jelena Radjenovic
Microwave-assisted synthesis of N/TiO₂/rGO and immobilization in a ceramic substrate for OMPs removal
- 11:00 – 11:30 **Sabrina de Boer**, University of Santiago de Compostela, Spain
Supervisors: Maria Teresa Moreira, Andreas Schaeffer
*Magnetic biocatalyst formulation with unspecific peroxygenase from *Agrocybe Aegerita* for antibiotic removal*
- 11:30 – 12:00 Poster session / Coffee break
- 12:00 – 12:30 **Francis dela Rosa**, Faculty of Chemical Engineering and Technology (FKIT), University of Zagreb, Croatia
Supervisors: Hrvoje Kusic, Mira Petrovic
TiO₂-Based Composite Photocatalytic Materials for Solar Driven Water Purification: Recent Achievements, challenges and opportunities
- 12:30 – 13:00 **Barbara Kalebic**, Faculty of Technology and Metallurgy, University of Belgrade, Serbia
Supervisors: Nevenka Rajic, Lidija Curkovic, Nikola Skoro
Removal of ciprofloxacin using zeolite-based adsorbents: Adsorption kinetics, mechanism and regeneration of the spent adsorbents
- 13:00 – 13:30 **Matej Kern**, Ruđer Bošković Institute, Zagreb, Croatia
Modeling the adsorption of emerging contaminants on carbon nanomaterials
- 13:30 – 15:00 Lunch

Session 4: Hybrid wastewater treatments

- 15:00 – 15:30 **Uwe Hübner**, Technical University of Munich, Germany
Hybrid systems for wastewater treatment
- 15:30 – 16:00 **Marina Gutierrez**, University of Ferrara, Italy
Supervisors: Paola Verlicchi, Dragana Mutavdzic-Pavlovic
Addition of activated carbon to a MBR: Strategies to improve micropollutant's removal supported by statistical analysis and adsorption experiments

- 16:00 – 16:30 **Michele Ponzelli**, Catalan Institute for Water Research (ICRA), Girona, Spain
Supervisors: Jelena Radjenovic, Konrad Koch
The Impact of Graphene Oxide on Methane Production Kinetics
- 16:30 – 17:00 Poster session / Coffee break
- 17:00 – 17:30 **Nebojsa Ilic**, Technical University of Munich, Germany
Supervisors: Jörg Drewes, Uwe Hübner, Gumersindo Feijoo
Tailoring adsorbents for targeted removal of PFAS
- 17:30 – 18:00 **Nikoletta Tsiarta**, Catalan Institute for Water Research (ICRA), Girona, Spain
Supervisors: Wolfgang Gernjak, Lidija Curkovic
Degradation of pharmaceuticals with heterogeneous catalytic ozonation-membrane filtration process using modified ceramic membranes
- 18:00 End of conference

City tour



Agenda Friday 13th May 2022

Location: The Inter-University Centre Dubrovnik (IUC)

Workshop **What after Nowelties?**

- 15:00 – 15:30 Mira Petrovic, ICRA, Spain - ***Career in science***
- 15:30 – 16:00 Laura Bertolini, ICRA, Spain
How to prepare your own competitive proposal and where to submit it
- 16:00 – 16:30 Lucia Gusmaroli, Catalan Water Partnership, Girona, Spain
Career in business-oriented companies and research centres associations
- 16:30 – 17:00 Tomislav Bolanca, Comprehensive Water Technology, Zagreb, Croatia
Entrepreneurship after NOWELTIES
- 17:00 Open discussion