ICCE 2023
VENICE

18TH INTERNATIONAL CONFERENCE ON CHEMISTRY AND THE ENVIRONMENT

www.icce2023.com

11 – 15 JUNE 2023 VENICE, ITALY

Venue:

SCIENTIFIC CAMPUS

CA'FOSCARI UNIVERSITY OF VENICE (ITALY)

Book of Abstracts

Società Chimica Italiana

Ca' Foscari University of Venice

EuChemS
European Chemical Society

Dear colleagues,

On behalf of the Executive Board of the European Chemical Society, I wish you a warm welcome to this 18th International Conference on Chemistry and the Environment. The European Chemical Society – in short EuChemS – is an overarching society at the European level with over 50 national member societies as members. In this way, EuChemS represents approximately 130,000 chemists from all over Europe. Did you ever realize that by being a member of your national society, you are a member of EuChemS too?

The slogan of this conference is 'Towards a pollution free society', which is well aligned with activities from EuChemS. The European Commission recently set up the Zero Pollution Stakeholder Platform and EuChemS was invited to join. The platform will effectively mainstream the zero pollution agenda by bringing together stakeholders and experts of different policy areas, including health, agriculture, research and innovation, transport, digitalization and the environment. EuChemS will emphasize to address the Zero Pollution challenges from the chemistry perspective in a science-based approach.

I am here in the Netherlands, but you are in the beautiful city of Venice, that I am sure will inspire you to have fruitful and constructive discussions on how to get to zero pollution and how to address many other challenges to create a sustainable environment. I wish you a very enjoyable conference!

Floris Rutjes

President of the European Chemical Society (EuChemS)

ICCE 2023 SPONSORS

Gold Sponsors

Waters™

Silver Sponsors

Agilent
Trusted Answers

BRUKER

toxics
an Open Access Journal by MDPI

Springer

fkv
PASSIONEIDEESOLUZIONI

Sponsors

EuChemS
European Chemical Society

Ca' Foscari University of Venice

ROVALTAIN FOUNDATION
RESEARCH IN ECO-TOXICOLOGY
For a world without pollution

PFAS, from here to Eternity - or maybe not

K. Kasalica[1], B. Jimenez[2], A. Yamamoto[3], H. Inui[4], M. Lješević[1], N. Radić[1], G. Gojgić-Cvijović[1], L. Slavković Beškoski[5], J. Radulović[5], T. Nakano[6], V.P. Beškoski[7]*

[1]University of Belgrade - Institute of Chemistry, Technology and Metallurgy, Njegoseva 12, Belgrade, Serbia
[2]Institute of Organic Chemistry (IQOG-CSIC), Juan de la Cierva 3, 28006, Madrid, Spain
[3]Tottori University of Environmental Studies, Tottori, Japan
[4]Kobe University, Biosignal Research Center - Japan
[5]Anahem laboratory ltd, Mocartova 10, Serbia
[6]Osaka University, Japan
[7]University of Belgrade-Faculty of Chemistry, St. trg. 12, Serbia

vbeskoski@chem.bg.ac.rs

Per- and polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals with extremely strong C-F bonds. Due to their thermal stability, acid resistance, and high surface activity, they have been widely used for several decades in various consumer products. PFAS has been detected in water, soil, sediment, air, food, and biota samples on all continents and due to this are recognized as environmental and human health risk (Carlson et al. 2022). In the last decade, several available technologies were tested for the remediation of PFAS-polluted environments, such as adsorption, filtration, thermal destruction, oxidation/reduction, and soil washing, but several disadvantages were reported (Bolan et al., 2021).
We hypothesize that by using advanced oxidation techniques followed by microbial treatment decrease in the concentration of PFOA as a PFAS model compound will occur. In the beginning, we tested separately abiotic and biotic degradation of PFOA. Target LC-MS/MS was used for quantitative analysis of PFOA decrease, and for detecting degradation products, non-targeted LC-MS/MS analysis was used.
In the photocatalysis study, we used selected Ti and Al-based photocatalysts. The experiments were conducted at 20 °C in an open cylindrical polypropylene reactor, and a simulated solar radiation lamp (Solimed BH Quarzlampen) was used as a light source.
Microbial communities were isolated from the locations in Serbia, Japan, and Italy known for their pollution with PFAS, and enrichment was conducted on the media supplemented with ppm values of PFOA (Beskoski et al., 2018). Microbial communities were used as inoculum in the PFOA biodegradation study.
Phododegradion of PFOA using Ti and Al-based photocatalysts ranged between 50 and 80% depending on the catalyst used. On some catalysts, sorption was observed, which additionally speeded up the degradation reaction. Based on the non-targeted analysis, shorter chain homologs of PFOA were detected, and their concentration increased during photocatalysis which was followed by a decrease in the parent compound. Free Fluoride ions were detected using ion selective electrode and ionic chromatography. In addition, a polyfluorinated compound with m/z 395 was detected as standard contamination, and a decrease of the concentration of this compound was also detected, suggesting that the applied technology is also active not only to per- but also to polyfluorinated compounds.
In the biodegradation study, the PFOA concentration decreased from 21 to 36% using the most active microbial consortia. From the enrichment, more than 30 pure colonies were isolated.
Our results confirmed that photocatalysis could be used for a decrease of PFOA and that microorganisms isolated from an environment polluted with PFAS chemicals can not only survive in this harsh environment but can also conduct the degradation of these chemicals under specific conditions. Further study will focus on optimization and a combination of these techniques.

References

Beškoski V.P. et al. (2018) 'Defluorination of perfluoroalkyl acids is followed by production of monofluorinated fatty acids', Science of the Total Environment 636, 355–359. doi: 10.1016/j.scitotenv.2018.04.243.

Bolan et al., (2021) 'Remediation of poly- and perfluoroalkyl substances (PFAS) contaminated soils – To mobilize or to immobilize or to degrade?', Journal of Hazardous Materials, 401, p.123892. doi:10.1016/j.jhazmat.2020.123892.

Carlson L.M. et al. (2022), 'Systematic Evidence map for over one hundred and fifty per- and polyfluoroalkyl substances (PFAS)', Environ. Health Perspect., 130(5), p.56001. doi:10.1289/EHP10343.