

Case Study

STRIVING FOR NET-ZERO THROUGH WASTEWATER TREATMENT

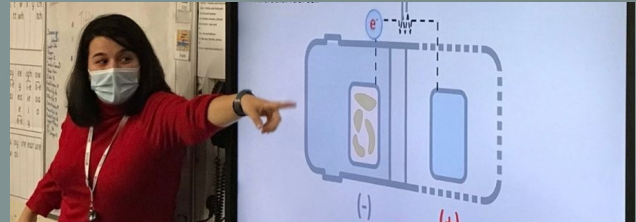
Supporting the Next Generation of Scientific Leaders

Wastewater comes from water used in the home, in businesses and factories and from rain falling on roofs or the roads and pavements. It has up to 10 times more energy inside of it than the energy used to treat and clean it. Microbial Electrochemical Technologies (METs) can recover energy and resources from wastewater, including electricity, hydrogen, and ammonia. Microbial electrochemical biofilms produce a suite of technologies that could bring the water sector to Net-Zero by recovering electricity and value-added resources from wastewater.

University of Newcastle postdoctoral researcher, Dr Pavlina Theodosiou is utilising these technologies to look at ways of turning sewage into electricity or hydrogen. Research to date using METs has seen Dr Theodosiou deliver low-cost sanitation with self-generated lighting in Africa; produce power from urine at Glastonbury Festival and 3D-print stackable microbial electrochemical reactors and control them robotically. Within her team, they are currently working on an NBIC Proof of Concept project that through a combination of modelling it aims to optimise METs and the production of hydrogen from wastewater.

Exposure to the industry can be a challenge for early career researchers and learning to navigate the different industry sectors can be invaluable. Through an NBIC FTMA industry secondment, Dr Theodosiou obtained hands-on experience and insight within the UK Water Industry. Working with the environmental consultancy Royal Haskoning DHV, Dr Theodosiou gained the skills and knowledge to undertake market research within water companies and develop a business case around METs. This enabled her to better understand the industry's demands and expectations and enable her team to package and develop MET systems to better suit these industry needs. Dr Theodosiou said,

"Through the FTMA I gained invaluable experience working on the business development side of emerging



Dr Theodosiou delivering an interactive workshop to engage children with the world of Microbial Fuel Cells (MFCs).

technologies within an engineering consultancy. I built commercial awareness skills and collaborated with the Innovation team at RHDHV to develop the MET business case, which helped us identify a new commercial pathway for the technology".

Dr Theodosiou is passionate about science communication and engaging girls with STEM activities in order to inspire and enthuse them about STEM careers and in the past has run a variety of public engagement activities. Through a recent NBIC Public Engagement and Outreach grant she delivered an interactive workshop series for schools to enthuse, inspire, and engage children with the world of Microbial Fuel Cells (MFCs) and investigate the possibility of producing electricity from waste and powering up small gadgets. The workshops received positive feedback from schools. Dr Theodosiou said,

"NBIC's outreach funding, gave me the resources to build, train and lead a team of future science communicators. We delivered an inspiring and impactful STEM program and engaged young minds with biofilms and environmental engineering, all thanks to this funding".

Dr Theodosiou is currently taking part in the Biofilms ICUR Sprint, delivered by SETsquared and NBIC. This is the first accelerated Innovation to Commercialisation of University Research (ICUR) programme dedicated to commercialising biofilm innovations. This will enable Dr Theodosiou and her team to 'get out of the lab' and validate their commercially promising research over eight weeks.



Dr Pavlina Theodosiou

Dr Theodosiou is a postdoctoral research associate at Newcastle University, where she specialises in wastewater treatment innovations. Her research interests include Bioelectrochemical Systems, Microbial Fuel Cells, Microbial Electrolysis Cells, Thermodynamics and Biofilms.