



Group picture at the Angkor University (Siem Reap, Cambodia) after the event “Chemistry and the Environment: IUPAC Contribution to Emerging Environmental Issues.”

Sea. Sakellariadou warned the audience that by 2050, the weight of plastics might exceed the weight of fish in the oceans. The audience also learned that microplastics can be found along all coast lines in the world and are particularly abundant on the shores of Asian waters. Given that Angkor University has a strong focus on agriculture, Diane Purchase and Annemieke Farenhorst focused their presentations on this area. Purchase provided for an overview of the valorization of agricultural wastes. Purchase talked about the different types of natural and synthetic agricultural wastes and their impact. In addition, a case study was presented showing that some agricultural wastes can be used such as xylitol, a substitute for sugar. Farenhorst presented on agricultural pesticides, going all the way back to about 4,700 years ago when sulfur was first reported as a tool to prevent rodent outbreaks in spaces inhabited by humans. Farenhorst discussed current-pesticides use and their fate processes, and highlighted some examples by which we can protect the environment from pesticide contamination. As such, the audience also learned about communities organizing the recycling of empty pesticide containers, and individual farmers using biobeds to capture their sprayer rinsate.

At the end of the day, the Rector of the Angkor University awarded all the speakers from Division VI

with a certificate of appreciation and expressed his interest in further collaboration with IUPAC in the interest of the local scientific community.

by Roberto Terzano (University of Bari, Italy), Fani Sakellariadou (University of Piraeus, Greece), Doo Soo Chung (Seoul National University, South Korea), Annemieke Farenhorst (University of Manitoba, Canada)

Tackling the global microplastic challenge

by Hemda Garelick and Weiping Wu

On 7 November 2022, as part of the APCE-CECE-ITP-IUPAC 2022 Conference in the Sokha Siem Resort and Conference Center of Siem Reap, Cambodia, the IUPAC Division VI held a symposium entitled “*The Environment, Health and Food Safety Impact of Microplastics*.” The aim of this meeting was to bring scientists together to discuss this emerging pollutant and consider new solutions on how to tackle this challenge.

In recent years, microplastics have been recognized as a global problem. Microplastics have been detected in environmental compartments such as soil, freshwater, and oceans. They were also found in food, drinking water, and human bodies. However, their impacts on the environment,

Conference Call



Pictures of the speakers at the Symposium “The Environment, Health and Food Safety Impact of Microplastics” in Siem Reap, Cambodia. Above, Lokesh P. Padhye and to the right: Diane Purchase.



human health, or food safety are not fully understood yet. More research and new solutions are needed to address the rise in microplastic pollution worldwide.

This symposium is part of IUPAC Project #2019-026-2-600 “The Environment, Health and Food Safety Impact of Microplastics” led by Weiping Wu, Shanghai

Microplastic pollution in the marine environment

Fani Sakellariadou (University of Piraeus, Greece)

Photodegradation of HDPE and assessing its contribution to microplastic pollution in coastal waters

Lokesh P. Padhye (University of Auckland, New Zealand)

Recent advances in the analysis and impact of microplastics in food

Clementina Vitali (Wageningen University, The Netherlands)

Status of microplastics in India

Bipul Behari Saha (Sagar Group of Institutions, India)

An overview of the technologies for microplastic remediation

Diane Purchase (Middlesex University, UK)

Microplastics contamination and their impacts in soil ecosystems

Balwant Singh (University of Sydney, Australia)

We need easy and feasible methods to quantify microplastics in drinking water or wastewater

Hyunook Kim (University of Seoul, South Korea)

Pyrolysis-GC/MSxMS for monitoring of microplastic contamination in plastic recycling work places

Roland Kallenborn (Norwegian University of Life Sciences, Norway)

Pesticide sorption by microplastics and other constituents in Prairie rivers

Annemieke Farenhorst (University of Manitoba, Canada)

From macroplastics to nanoplastics: the presence of plastic particles in personal hygiene products and their possible impact on the environment and on human health

Hemda Garelick (Middlesex University, UK)

Lectures presented at the symposium “The Environment, Health and Food Safety Impact of Microplastics” on 7 Nov. 2022.

Institute of Optics and Fine Mechanics, China. The project is bringing together polymer experts, analytical chemists, environmental scientists, and a diversity of stakeholders and experts from all areas to work together on this important, interdisciplinary topic.

The symposium was chaired by Hemda Garelick from Middlesex University, UK. Fani Sakellariadou from the University of Piraeus, Greece gave a keynote talk titled *"Microplastic pollution in the marine environment."* Balwant Singh from the University of Sydney (Australia) delivered an invited talk on "Microplastics contamination and their impacts in soil ecosystems." Different views on the challenges of microplastics were presented – see program summarized in the table.

Various topics including plastic product innovation, industrial leadership with extender producer responsibility, advanced plastic waste remediation and recycling techniques, diversified plastic waste management systems, together with strong commitments from local and international organizations and governments were discussed. The symposium outcomes will provide a scientific base to support the understandings and actions to prevent and reduce microplastic pollution and enhance the safety of humans, aquatic animals and the ecosystem. The symposium along with the IUPAC microplastic project will strengthen the role of IUPAC in contributing to solving environmental problems and enhancing the quality of food and life on a global scale.

<https://iupac.org/project/2019-026-2-600/>

Poly- and perfluoroalkyl substances (PFAS) in the environment

by Melanie Kah and Rai Kookana

Per- and polyfluoroalkyl substances (PFAS) are a major environmental concern globally due to their widespread usage and persistence. They found widespread applications in industry due to their unique chemistry of having both hydrophilic and hydrophobic (surfactant-like) properties. However, concerns about these chemicals have been growing due to their long-term persistence in the environment, potential for bioaccumulation and toxicity to human and ecological health.

In 2001, when it was realized that PFASs are bioaccumulative, PFAS production started to be phased out in Western Countries. However, it continued in Asia thus shifting the problem to emerging economies. Unfortunately, the true extent of PFAS problem has not

been yet recognized in the emerging economies and this may become a serious issue for the local environments and population.

With the aim of raising awareness around this important environmental issue, IUPAC Division VI held a symposium on "Poly- and Perfluoroalkyl Substances (PFAS) in the Environment" on Monday 7 November 2022 in Siem Reap (Cambodia) as part of the APCE-CECE-ITP-IUPAC 2022 Conference.

This symposium was part of IUPAC Project 2019-029-1-600 *"Per and polyfluoroalkyl substances (PFASs) in the environment: Information for emerging economies on PFASs analyses in environmental media and their impacts on human health"* led by Melanie Kah of the University of Auckland, New Zealand. The project, through a multidisciplinary approach, aims at coping with three overarching aspects around PFAS, namely: analytical chemistry in environmental media, human health effects from environmental exposure, and PFAS management response by regulatory and policy agencies.

At the PFAS symposium, nine speakers represented a diversity of perspectives and approaches to tackle the PFAS environmental problem across the USA, Australia, New Zealand, the Philippines, China and Canada.

The first session was chaired by Rai Kookana (CSIRO/ University of Adelaide, Australia) to set the scene by covering general aspects related to the challenges of dealing with contamination with PFAS. Topics included the behaviour of PFAS in soil by the keynote speaker Christopher Higgins (Colorado School of Mines, USA), occurrence and fate in wastewater treatment plants, risk assessment, management, and remediation of PFAS. Other speakers included Karl Bowles (RPS AAP Consulting Pty Ltd), Melanie Kah, Balwant Singh (University of Sydney, Australia), and Divina Navarro (CSIRO/University of Adelaide, Australia).

The second session was chaired by Melanie Kah (IUPAC Project Task Group Chair), and covered aspects more specific to Asia. These included the bio-monitoring work carried out by the keynote speaker, Michael Velarde (University of the Philippines Diliman), an overview on data available on the occurrence of PFAS in soil and water in Asia, and China in particular. Other speakers were Rai Kookana, Guang-Guo Ying (South China Normal University, China) and Zoltan Mester (National Research Council of Canada).

<https://iupac.org/project/2019-029-1-600/>