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#EnvChem2020: Chemistry of the Whole Environment Research

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Abstract:	This special section contains four papers presented at the online international conference #EnvChem2020: Chemistry of the Whole Environment Research, hosted jointly between the Environmental Chemistry Group of the Royal Society of Chemistry (RSC) and the UK Branch of the Society of Environmental Toxicology and Chemistry. The #EnvChem2020 conference was originally intended to take place at the University of York but was moved online as a result of the COVID-19 pandemic and registration made free of charge for all delegates.

#EnvChem2020: Chemistry of the Whole Environment Research

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We were astounded by the response of the environmental chemistry community. We received 48 abstracts from delegates and have had 367 delegates register to join the conference online. It is clear that there was a high demand for this type of event and we welcomed delegates to our online Zoom platform from all over the world. The conference included presentations made in five key categories; (i) Environmental Processes in Soil, Water and Air, (ii) Emerging Contaminants, (iii), Novel techniques, (iv) Atmospheric Chemistry, and (v) Ecotoxicology. The papers presented here represent the breadth of the research shared at the meeting.

Maskrey (2021) report a new analytical method for the detection of pharmaceuticals, metabolites, and related bioactive compounds in bivalves and mussels. The work included the development of a rapid and simple solvent-based extraction of whole tissue homogenate and analysis by Ultra–High-Performance Liquid Chromatography–Tandem Mass Spectrometry. The paper reports reasonable extraction efficiencies, a high degree of linearity, good precision and accuracy, and limits of detection that allowed the detection of twelve compounds in quantifiable concentrations in environmental samples collected from the English and Welsh official biotoxin monitoring program. Seven of the twelve compounds were antidepressants.

The sources, pathways, and partitioning of antibiotics in the aquatic environment was reviewed by Harrower (2021) along with their occurrence in wastewater, surface water, sediment, and soils, and methods by which they can be removed in wastewater treatment plants (WWTPs). The review article provides fundamental background associated with how antibiotics enter WWTPs and their importance in impacting antimicrobial resistance (AMR). The influence of the chemical composition and functionality of individual antibiotics on the degree to which it is ionised, and how this influences partitioning, is outlined using examples from several major classes of antibiotics. The mechanisms by which antibiotics can be photodegraded or biodegraded in the environment, and the influence of physio-chemical properties, is discussed before an overview of typical concentrations in

various environmental media are presented. Finally, some suggestions regarding how antibiotics can be removed from wastewater using tertiary treatment processes are provided.

Barnett (2021) outline a methodology by which the polymer types of microplastics can be identified in the field using density separation with non-hazardous chemicals. The work represents a solution to the problem faced by scientist working in remote locations in the field that do not have access to analytical equipment (e.g. spectroscopy) to identify the type of polymer of a microplastic sample. The method developed uses mixtures of ethanol, distilled water, and sugar to generate a range of solutions with different specific densities. Polymer samples are then classified based on whether they float or sink in particular solutions. The method was successfully able to distinguish seven common polymers collected from the sea and shoreline of the Greek island of Samos in the Aegean Sea.

Ogunkunle (2020) report the results of a pot experiment to demonstrate the effectiveness of cocoa-pod derived biochar to reduce the mobility of Cd in contaminated soils, enhance soil enzyme activity, and reduce Cd uptake by tomato plants. Agricultural soils become contaminated with Cd from several sources, including as an impurity in fertilisers. Biochar was made by burning cocoa pods in the absence of oxygen and then added to soil that was artificially spiked with $CdCl_2$ salts and planted with tomato seedlings. The high surface area of the biochar and the presence of functional groups, shifted the chemical availability of the Cd into less extractable fractions and a soil application rate of 1% (w/w) showed a dramatic reduction in the uptake of Cd into the roots, stem, and leaves of the tomato plants. However, an application rate of 3% resulted in tomato plants that did not survive to harvest, highlighting the importance of further research to identify appropriate rates of amendment.

In conclusion, the papers in this special section are representative of the quality and breadth of the science presented at #EnvChem2020. These presentations included combinations of literature synthesis, method development, environmental monitoring, and systematic experimentation. The organisers appreciate all the contributions of the presenters and especially those contributing an article to this special section.

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