will be used to determine changes in mRNA expression. The O3 and UV TPs were the most cytotoxic and caused an increase in ROS in LMH spheroids. The OH and NOx TPs had similar cytotoxicity as 6PPD (LC50 values between 0.09-0.18) in LMH spheroids and all three mixtures increased ROS concentration. The decrease in ATP concentration and increase in ROS by 6PPD and the TPs suggest impairment of mitochondrial function in LMH spheroids. The rate of oxygen consumption in the spheroids will elucidate more information on mitochondrial toxicity, while gene expression data will provide information on the mechanism of toxicity for 6PPD and the TPs. Based on the prevalence of these compounds, this study will generate much needed toxicity data for avian species.

6.08.P-Th567 Instantaneous photocatalytic degradation of pesticides over coupled ZnO@CdS nanocomposite via greener approach

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Photoactive ZnO@CdS coupled nanocomposite was designed by *Azardirachta indica* extract via greener mode. Consequently, the targeted pesticides chlorpyrifos (CP) and atrzaine (ATZ) have high poisonous and persisting behavior in the environment. Different spectroscopic and microscopic techniques were performed to characterize the coupled nanocomposite. Crystalline behavior and irregular shape with 50nm particles size was suggested by PXRD and FE-SEM analysis, respectively. New spectroscopic vibration of Zn-S and Cd-O rooted the coupling of parent nanomaterials. The photo-catalytic activity of ZnO@CdS for degradation of pesticides was monitored at different concentration of pesticides, catalyst dose, variable pH parameter and irradiation source (light and dark). The large extent of degradation (89-91%) to visible region was due to reduction in band gap (1.67 eV), enhanced surface area ($111m^2g^{-1}$) and diminished ionic species recombination capability. The generation of photo active radicals was confirmed by scavenger analysis. The Effect of ionic strength was helpful to understand the interaction mechanism involved in the removal of contaminants. Being more effective than natives, ZnO@CdS has substantially suppressed the half-life of pesticides as revealed from generation of smaller and less toxic metabolites. The generation of smaller and non- toxic byproducts was analyzed by GC-MS technique. Langmuir model amd first- order kinetics followed by photocatalyst in degradation process. Robust and photocatalytic behavior of ZnO@CdS upto 10th cycle could deep-rooted its sustainability high efficiency for environmental and industrial purposes.

6.08.P-Th568 Co(II) oxidation to Co(III) at magnetite surface under oxidizing conditions

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Magnetite (Fe_3O_4) and maghemite (Fe_2O_3) nanoparticles are widely used in environmental applications, particularly for soil and water decontamination. However, the interactions between metal ions and magnetite are not yet well understood, especially for transition metals. Our recent work[1] allowed to identify the formation of different Co(II) species at the surface of stoichiometric magnetite (Fe(II)/Fe(III) = 0.5). However, magnetite nanoparticles are most often used under oxidizing conditions. Therefore, the influence of oxidation on Co adsorption on oxidized magnetite (with Fe(II/Fe(III) ratio = 0.1) was here studied.

Magnetite nanoparticles were synthesized by co-precipitation of iron salts under anaerobic conditions, then oxidized with H_2O_2. Co adsorption kinetics were performed under aerobic and anaerobic conditions, and revealed different adsorption behavior, with instantaneous adsorption under aerobic conditions and longer under anaerobic conditions. Batch adsorption studies were carried out under oxidizing conditions, with Co concentrations ranging from 0.1 to 12 mM, at pH 8, at room temperature. Some of the samples were filtered to determine the extent of Co removal from the solution. The solid phase was analyzed at SOLEIL synchrotron by X-ray spectroscopy (XAS) and X-ray magnetic circular dichroism (XMCD) at Co $L_{2,3}$-edge. Furthermore, Co-magnetite reaction kinetics were followed by Quick-XAS at Co K-edge and multivariate curve resolution with alternating least-squares fitting (MCR-ALS).

Batch adsorption kinetic of Co onto magnetite drastically differed between aerobic and anaerobic conditions. Three Co species could be differentiated over time after MCR-ALS treatment of the Quick-XAS data. The first one, characteristic of Co(II), rapidly vanish, while the third one corresponds to Co(III) and, therefore, to the oxidation of Co(II) to Co(III). These results are supported by those obtained on the DEIMOS line, where the spectra reveal, once the reaction is complete, the presence of a mixture of Co(II) and Co(III) on the surface of the magnetite, with a larger proportion of Co(III) at high [Co]. The second species, difficult to determine, might therefore be a mixture of oxidized Co(II) and precipitated Co(II).

This study highlights the formation of mixed species of Co(III) and Co(II) precipitated on the magnetite surface, depending on the initial Co concentration, which might play a role in Co behavior and fate in oxic environments.

6.09 Plastic Pollution: Bridging the Gap Between Science and Policy Needs

6.09.T-01 Experimental Assessment of Plastic and Biota Removal by Plastic Clean-up Mechanisms

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Due to mismanaged plastic and its accumulation in the environment, various technologies have been developed and deployed to collect legacy plastic. However, because of the novelty and multitude of these technological mechanisms (i.e., the mechanical processes by which litter is gathered to a collection point, to be collected), their positive and negative impacts on the environment are, so far, largely unknown. As plastic clean-up technologies play a significant role in minimizing plastic litter in the environment, and as the United Nations Environment Assembly is working towards a legally binding and international treaty to target plastic pollution by 2024, empirical data are needed to guide and regulate the use of these technologies to ensure their net benefits. Since numerous parameters determine the collection of plastic and biota by plastic clean-up technologies, this study aimed to experimentally investigate the effects of four parameters (i.e., flow velocity, biota shape, plastic type, and plastic load) on the recovery rates of plastic and biota. Without intending to mimic the exact design of any specific company, we tested two independent, generic, and non-commercial plastic clean-up mechanisms, which we custom-built specifically for the experimental setup. The experiments were performed in a laboratory flume in which various conditions of each of the selected parameters were controlled and individually tested. For instance, three flow velocities (i.e., 0.1, 0.2, and 0.3 m / s) were separately assessed, while the other parameters were kept constant. Our preliminary results suggest that changes in flow velocity might have different effects on the recovery rate of biota. In a real case scenario, the removal of plastic or biota by a plastic clean-up mechanism is a combination of multiple parameters interacting with each other. Nevertheless, empirical studies such as this are necessary to establish baseline effects of each single parameter, contributing to the parameterization of hydrodynamic and ecological models.

6.09.T-02 Predicting Plastic Degradation and Fragmentation in the Environment

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The degradation and fragmentation of plastic in the environment is an important process that can have a significant impact on fate, exposure, bioavailability and ultimately risk. Therefore, future policy needs should consider the ensuing heterogeneity in sizes, shapes and degradation states. To enable this, prospective risk assessments must include information on plastic degradation and fragmentation, requiring the ability to make predictions of these across a range of environmental compartments and polymer types. In recent years, our mechanistic understanding of degradation and fragmentation has been developing, but until now, that knowledge has not been embedded into predictive modelling approaches. In this presentation, we introduce the FRAGMENT-MNP model – the first model to embed a mechanistic conceptualisation of plastic degradation and fragmentation, thus enabling realistic predictions of fragmentation and the subsequent evolution of size distributions for a broad range of polymers, environmental compartments and their environmental stresses.

The model conceptualises fragmentation rates, dissolution rates and fragment size distributions (the split of fragmenting mass amongst smaller size classes) that are functions of the degradation state of the polymer, polymer type, particle size, and mechanical power input. To parameterise the model, a comprehensive database of degradation and fragmentation experiments has been compiled. This includes a broad range of polymers (LDPE, PP, HIPS, PU, PET, PLA, and PA) that have undergone photolysis, hydrolysis and enzymatic hydrolysis at different temperatures and humidities, followed by mechanical disruption. We fit a machine learning model to these data in order to scale fragmentation rates, degradation rates and fragment size distributions to those corresponding to degradation stresses and mechanical powers likely to be encountered in the environment.

Our model is open-source and pragmatic in its data requirements, making it an easily usable tool for industry, regulators and academia, as well as being easy to integrate into exposure models. This offers a strong bridge between scientific understanding and potential future policy needs that take plastic heterogeneity into account.

6.09.T-03 Leveraging Physiology & Behavior to Better Understand Exposure, Uptake, & Elimination of Micro- and Nanoplastics (MNP) in Pelagic & Benthic Species within the Context of Quantitative Risk Assessment

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A significant body of ecotoxicological data have been developed for micro- and nanoplastics (MNPs). However, there remain challenges in synthesizing and interpreting these data within the context of ecological risk assessment. While many of these challenges are being addressed, particularly those around study design, QA/QC, and reliability, one significant challenge remains - identification of relevant species for use in the development of ecological protection criteria (i.e., PNECs, HC5). Previous studies have attempted to derive these values, however significant differences in species sensitivity have been observed for micro- vs. nano-sized particles. This results in (1) significantly different PNEC values as a function of the selected particle size / size range, and (2) uncertainty as to the relative sensitivities of different aquatic species to different MNP size, shape, and polymer types.