

Impacts of microplastics on bioavailability of heavy metals in soil

Lead Supervisor: Dr Mónica Felipe-Sotelo, University of Surrey, School of Chemistry and Chemical Engineering

Email: m.felipe-sotelo@surrey.ac.uk

Co-supervisors: Professor Tom Sizmur, University of Reading; Dr Tom Bond, University of Surrey

Microplastic pollution is a global problem. Although most research on microplastics focuses on their importance as pollutants in the marine environment, it has been estimated that the amount found in soils is actually 4 to 23 higher than the oceans. Microplastics in soil can act as vectors for the transport of pollutants, such as heavy metals, which can enter the food chain and potentially bioaccumulate in higher organisms, including humans. Initially you will study the capacity of microplastics to accumulate heavy metals (such as Sb, Cd, Hg and Pb) in well-controlled laboratory experiments. Subsequently, you will investigate the mobility of heavy metals and microplastics in column tests where samples of contaminated soil will be flushed with synthetic rainwater. Finally, you will assess the bioavailability of heavy metals associated with microplastics in greenhouse trials using model crops cultivated in soils with realistic levels of contaminants. Crops grown in this way will be analysed to determine the uptake and bioavailability of heavy metals and the risk to human health evaluated. The project will provide you with the knowledge and skills to evaluate the significance of interactions between heavy metals and microplastics in soil and the potential for these interactions to result in pollutants entering the food chain.



Training opportunities:

You will be trained in the use and optimization of multiple analytical techniques for the characterization of the microplastics, their degradation, and composition. These will include inductively coupled plasma mass spectrometry, infrared and Raman spectroscopy, scanning electron microscopy and energy dispersive X-ray analysis. Subsequently, you will learn a new set of skills related to soil science to investigate the impact of microplastics on heavy metal biogeochemistry and plant uptake. Training and guidance will be provided on a range of technical aspects required for successful completion of the project: analytical chemistry, environmental chemistry, soil science, statistics, data visualisation, and scientific writing.

Student profile:

This project would be suitable for students with a 1st class or upper 2nd class degree in Environmental Science or Chemistry and with knowledge or interest in soil science, inorganic geochemistry, or analytical chemistry.

<https://research.reading.ac.uk/scenario/>