



Scenario
DOCTORAL TRAINING PARTNERSHIP

NERC
SCIENCE OF THE
ENVIRONMENT

Do microplastics transfer potentially toxic elements from water to soil?

Lead Supervisor: Mónica Felipe-Sotelo, University of Surrey, Department of Chemistry
Email: m.felipe-sotelo@surrey.ac.uk

Co-supervisors: Tom P. Sizmur, University of Reading, Department of Geography and Environmental Science, Email: t.sizmur@reading.ac.uk; Tom Bond, University of Surrey, Department of Civil and Environmental Engineering, Email: t.bond@surrey.ac.uk

The overall aim of this project is to determine to what extent plastic microfibres can act as vectors for the transfer of potentially toxic elements from water to soil.

Plastic debris with a diameter of <5 mm are classified as microplastics, which may be found in surface waters in concentrations of up to 100,000 fragments per m³. An important category of microplastics are the synthetic fibres shed when washing clothes: a single garment can release ~2000 microfibres per wash into domestic wastewater. However, little is known about how many microfibres can enter soil and freshwater environments through wastewater treatment plants.

Potentially toxic elements (e.g. Sb, Cd, Cr and Pb), which may occur in elevated concentrations in both wastewater and sewage sludge, can adsorb to the surface of microplastics. Hence, there is potential for these elements to be transported by plastic microfibres in wastewater and sewage sludge and enter terrestrial ecosystems by this route. The aim of this project is to investigate how microfibres can affect the biogeochemical cycling of potentially toxic elements in soils and alter their availability to soil organisms, such as earthworms.

As part of this project you will have hands-on experience investigating the fate, composition and element-binding properties of microfibres. You will develop robust experimental methods to isolate and detect microfibres from laundry wastewater, soil, and sewage sludge, and characterise their physical and chemical properties. In the next stage of the project you will design and set up experiments to investigate the interaction of microfibres with potentially toxic elements. Finally, you will study whether these hazardous pollutants can be transferred to soil invertebrates (earthworms) by exposing them to the microfibres used in the previous experiments.



Training opportunities:

During your PhD studies you will integrate within the active multi-disciplinary community of researchers of the Chemistry, and Civil and Environmental Engineering Departments at the University of Surrey. You will participate in the meetings and activities organized by the “Plastics in the Environment Interest Group” at Surrey. You will have the opportunity to receive training in the operation of state of the art analytical instrumentation at the Department of Chemistry and join a wide range of professional training courses at the University of Surrey.

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.

<http://www.reading.ac.uk/nercdtp>