



The synthesis of novel Deep Eutectic Solvent (DES) and its application in plastic recycling
EPSRC funded PhD studentship with full fee waiver and £21,805 pa stipend (2026/27 rate)

Project Code: DLA_DTP_2026_03

Main Supervisor: [Professor Chenyu Du](#)

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Project Introduction

Microplastic pollution is a pervasive and growing environmental problem driven by the widespread release and persistence of plastic particles across ecosystems. Microplastics infiltrate aquatic food webs and pose potential risks to human health. Laundry is a major source of microplastic, accounts for 35% of all microplastics in Ocean. This project aims to synthesise novel Deep Eutectic Solvents (DES) to work efficiently at mild temperature and design a device to fit on drainpipe of washing machine for catching leftover microfibrils and filter regeneration using DES. The target is to **remove 90+% microplastic** released from household laundry.

Project Details

Currently, the global plastic production is ~750M tonnes/year, while 22 M tonnes/year of plastic waste enters ecosystems each year. Among the most harmful contributors are microplastics. Each laundry cycle releases 0.75-1.5 million microfibrils, contributing to a global emission of ~0.5 million tonnes/year of microplastics.

DES—formed from hydrogen bond donors (HBD) and acceptors (HBA) —have emerged as green solvent and catalysts for polymer depolymerisation, enabling chemical recycling of plastics. It was demonstrated complete degradation of PET fibres at 90°C in 1-hour using DES. This project aims novel DES discovery for efficient microplastic dissolution at mild temperature over longer time rather than a fast, high-temperature reaction for microplastic mitigation in laundry.

First, to achieve robust low-temperature performance and high solid-loading capacity, DESs will be formulated systematically by screening HBA and HBD. AI-assisted design will be used to optimise key parameters—molar ratio, mixing temperature, stirring speed—to produce DES with low viscosity, biodegradability, and thermal stability. The DES formulations will be tested for dissolving PET fibres. AI-prediction tools will be used further to optimise solid loading and operating temperature. Kinetic studies for identifying degradation pathways and FTIR/Raman/HPLC for characterisation of polymer degradation will be carried out. This integrated approach will deliver an optimised DES formulation and operating conditions for efficient microplastic depolymerisation.

Then, a retrofittable plug-and-play device will be designed and prototyped for microplastic capture and dissolution to fit with existing domestic washing appliances. Unlike the existing passive capture devices, the newly designed device will be able to dissolve microplastics with DES, eliminating the manual recycle of captured microplastics. In addition to that, a double-chamber design will also enable self-cleaning and regenerating the capture filter for easy maintenance. Computer aided design and Computational Fluid Dynamics simulation will be employed to study fluid uncertainties and optimise the design for maximum capture and dissolution and reducing possible clog. This project advances multidisciplinary science to eliminate textile microplastics at source. It establishes formulation–structure–function relationships for DES operating under mild conditions, reducing energy use and H&S risks. Lower-temperature DES could transform environmental remediation, while a hybrid capture–regeneration architecture offers a novel pathway for textile microfibre removal.



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Project-specific entry requirements

BEng/BSci or MEng/MSci, Chemical Engineering, Chemistry or similar programmes, 2:1 or above.

Further Information

This call is open to **UK Applicants only**.

Applicants should be of outstanding quality and exceptionally motivated.

The studentships are funded for 3 years (subject to satisfactory annual performance and progression review) and will provide for tuition fees and a tax-free stipend paid monthly.

Please note that there are more projects than funded studentships available and therefore this is a competitive application process which will include an interview. Shortlisted candidates will be contacted for an interview in person or via Teams. After interview the most outstanding applicants will be offered a studentship.

Queries about the application process are welcome and should be emailed to pgrscholarships@hud.ac.uk.

Informal enquiries about this project should be directed to [Professor Chenyu Du](#).

Type of Award: Doctor of Philosophy (PhD).

Eligibility: UK applicants only. First Class or Upper Second-Class Honours degree or equivalent in a relevant subject area, please refer to the entry requirements on the specific projects being advertised.

Location: Huddersfield.

Funding: 3 years full time research covering tuition fees and a tax-free bursary (stipend) starting at £21,805 for 2026/27 and increasing in line with the EPSRC guidelines for the subsequent years. Funded via the Engineering and Physical Sciences Research Council Doctoral Training Programme.

Duration: 3 years full-time plus 12 months writing up (please note that no funding is available for the writing up period).

Closing date: 28th April 2026

Start date: 1st October 2026

Application details

- Go to the EPSRC webpage and download the [Expression of Interest Form 2026](#).
- Provide copies of transcripts and certificates of all relevant academic and/or any professional qualifications.
- Provide references from two individuals – please contact your referees and ask them to send them directly to pgrscholarships@hud.ac.uk from their email address.
- Proof of eligibility – e.g. scan of passport photo page
- Completed forms, including all relevant documents should be submitted via-email to pgrscholarships@hud.ac.uk.

Please note: if you do not attach all the relevant documentation prior to the closing date your application will not be considered.