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# Hunting for Microplastics: An Approach for Extracting Residues from Soil

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## Introduction

Microplastics are present in all aspects of the environment and their inclusion in soil/terrestrial systems is a relatively new interest. There are no agreed upon methods for their recovery, extraction, or their analysis in soil. We explored an automated method for extracting plastics from soil. This poster describes our approach.

## Accelerated Solvent Extractor

We utilized an *Accelerated Solvent Extractor*, or ASE (right), as the primary tool to remove plastics from soil analogs. Our extraction methods were adopted from Fuller and Gautum (2016, Environ. Sci. & Technol.) The ASE uses hot solvents (≥100 °C) and high pressure (~1500 psi) to perform extractions.

Workflow

**1.** Extraction cells were loaded with soil analogs or natural soil and spiked with plastics.

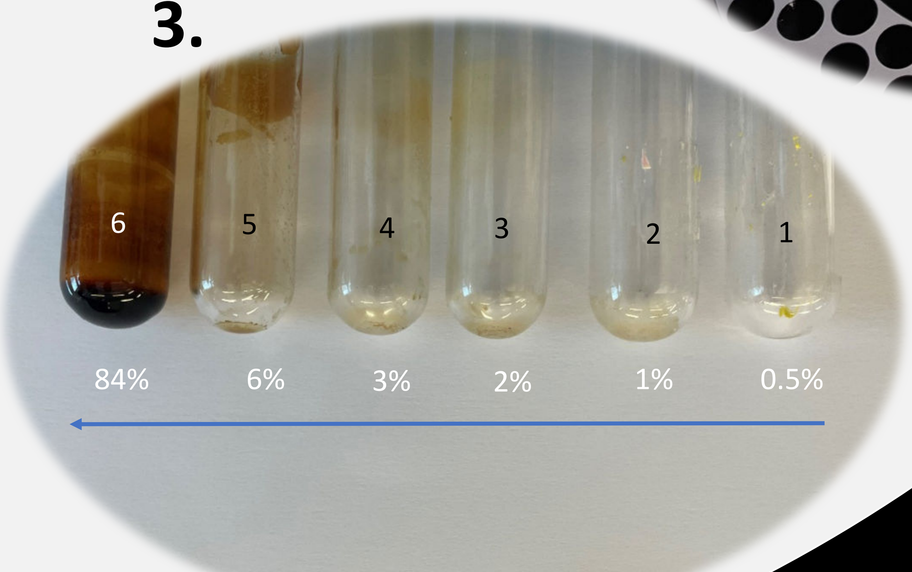
**1.**

**2.** The cells were first washed with methanol to remove organics. Methylene chloride was the final extraction solvent. The solvent was collected across several test tubes. Plastic residue was 'recovered' by heating and evaporating the solvent under vacuum.

**2.**

**3.** Post drying tube residuals. The percentages represent the residual PET in each tube.

**3.**

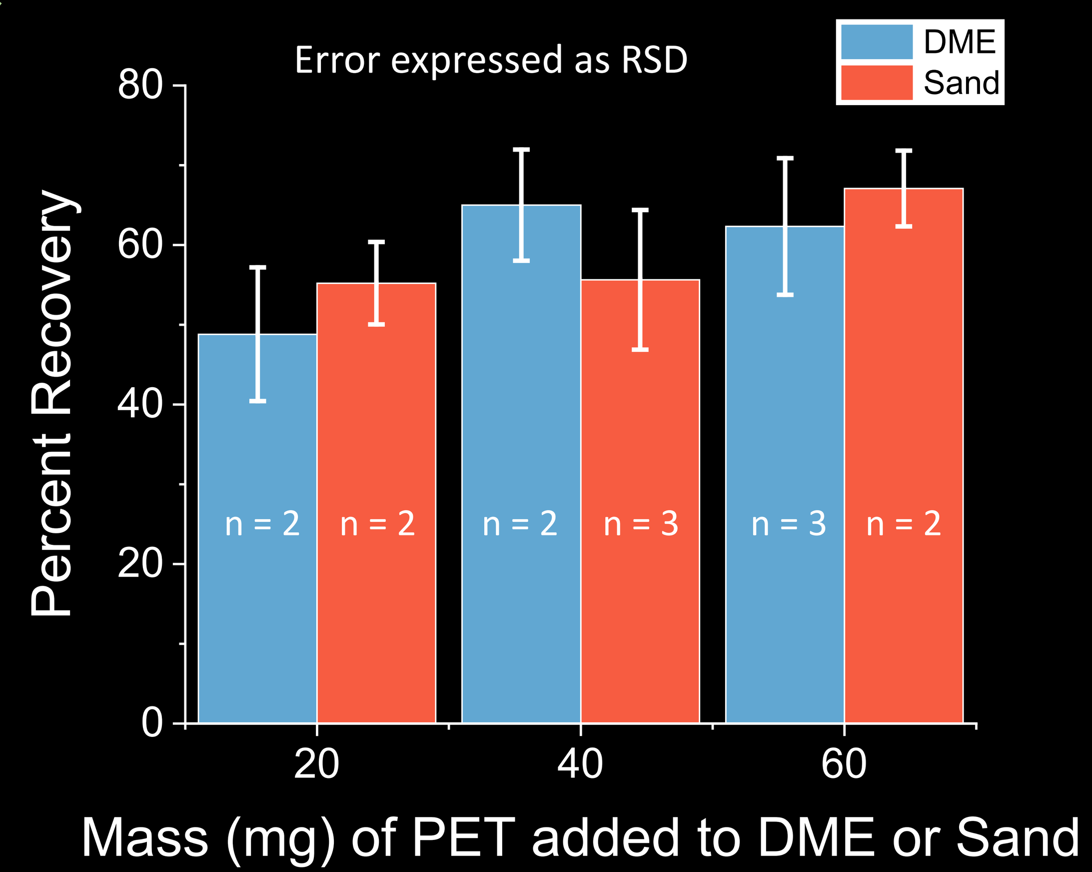



## Objectives


Our goals were to test and standardize a method for extracting microplastic residues from soil. We used PET (polyethylene terephthalate), a commodity plastic to confirm:

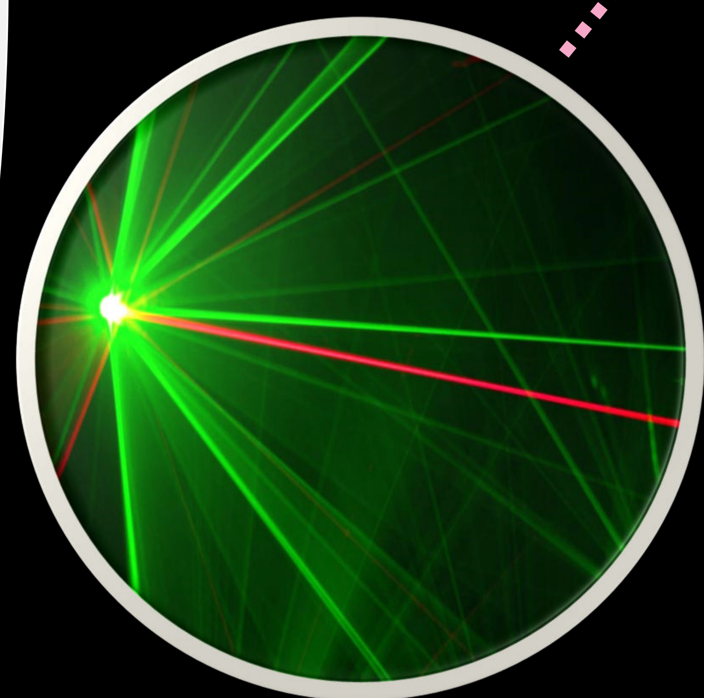
- ASE extraction efficiency in diatomaceous earth (DME) and sand as soil analogs, and natural soil
- The chemical identity (fingerprint) of the extracted materials using Raman spectroscopy

## Spiked Recoveries



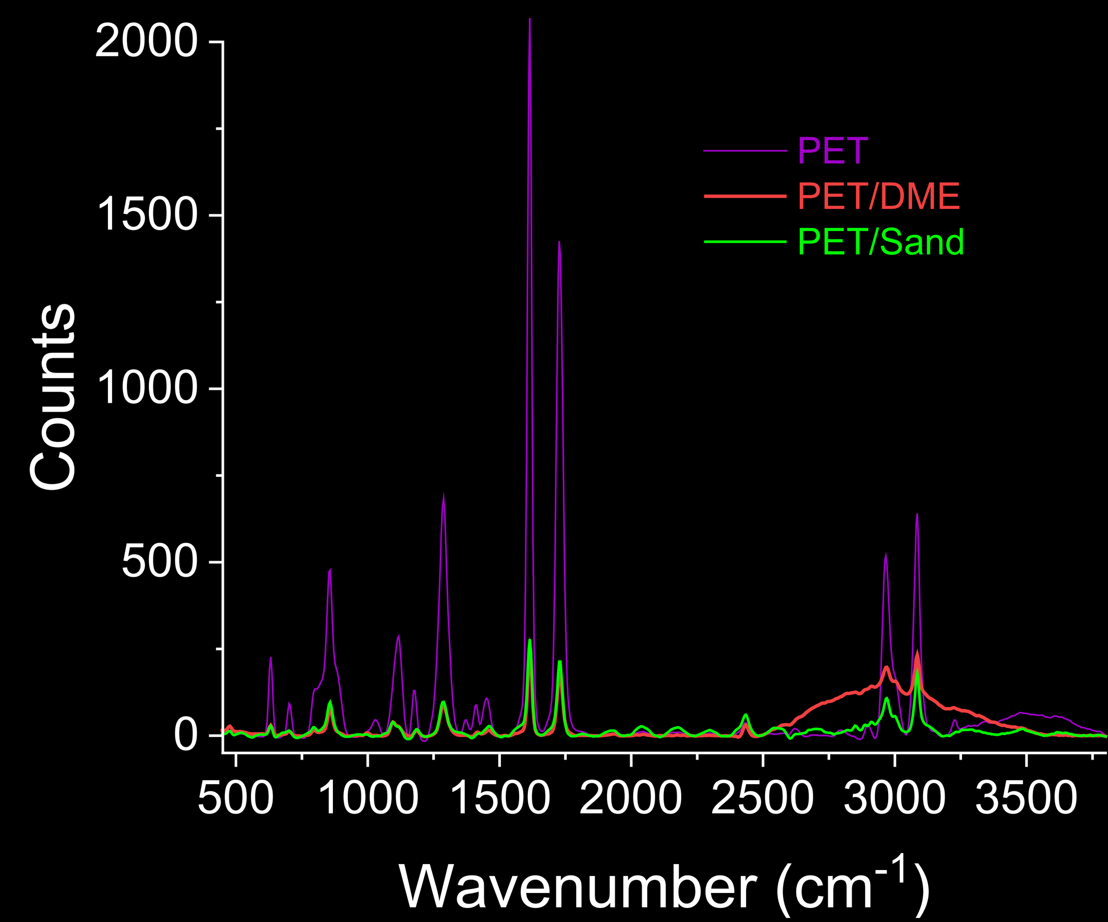

- DME and sand were spiked with 20, 40, 60 mg PET
- Plastic was 'recovered' by scraping tube residue
- Scrapped recoveries ranged from approx. 50-70 %
- Gravimetric analysis of vials suggest recoveries may increase to approx. 70-95 %
- Blank analyses of DME and sand were clean, PET was not present

## Raman Spectroscopy



Spectral fingerprints of the pure PET polymer and their extraction in DME and sand are agreeable, but we observed:

- Different signal intensities among samples
- Interference (broad peak) between 2500-3500 $cm^{-1}$ for PET/DME sample




## Challenges and Future Steps

Trials with soil dried into a tar, resulting in no recovery. We suspect this may be related to how we were evaporating the solvent. Future tests will continue to improve recoveries in soil and explore:

- Alternate drying methods
- Other types of common plastics
- Double spiking experiments (using two or more plastics)
- The role of the ASE and cell packing techniques in recovery attempts

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