RESEARCH, DISCOVERY & INNOVATION
Water & Energy Sustainable Technology Center

RESEARCH ON INCIDENCE, TRANSPORT AND IMPACT OF MICROPLASTICS IN THE ENVIRONMENT

Issue: Microplastics are a diverse group of polymer-based particles less than 5 mm in size. Typically, microplastics consist of fibers or beads of polyester, polyamide, polyethylene, polypropylene or polystyrene. Although there are reports on the incidence of microplastics in environmental matrices based on microscopic techniques, little is really known of the extent of microplastic pollution. Even less is known of the fate, transport and influence of microplastics on human and environmental health.

Figure 1. Image of microplastics

WEST CENTER EXPERTISE

State-of-the-art detection of microplastics, WEST/Pima County Wastewater/UA Department of Chemistry

Agilent 8700 Laser Direct InfraRed Spectroscopy

- Allows for quantification of:
  - Number of microplastic particles
  - Size of particles
  - Type of microplastic
- Currently only two such instruments within the US
- Can be used for detection within water, effluent, sewage, and soil

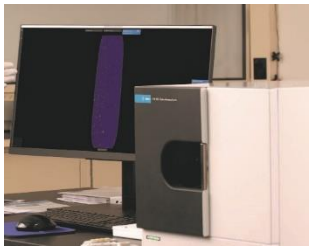

Figure 2. Agilent 8700 LDIR Chemical Imaging System

Influence of microplastics on soil health

Microplastics, more than 12,000 megatons by 2050, will find their way into environmental systems, with agricultural soils potentially storing more microplastic than the oceans. Although soils can contain upward of 40,000 micro particles per kilogram, almost nothing is known of the impact of microplastics on soil health.

- WEST has developed innovative new approaches to soil health
  - Real time assay for soil health via estimation of metabolic activity using AMP Indices
  - Functional activity potential evaluated via transcriptonomics
  - Assays used to evaluate short-term and prolonged exposure to microplastics

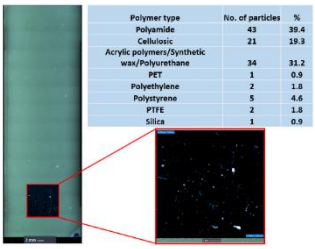

Figure 3. Example of Agilent 8700 LDIR image data output

Potential transport of microplastics through soil to groundwater

- WEST has extensive experience in the transport of nanoparticle sized polystyrene microspheres through soil.
  - Microspheres used as surrogates for human pathogenic viruses
  - Transport evaluated by analysis of well water at variable depths from the soil surface

Engineered solutions for microplastics in water

- WEST has intermediate-scale advanced water treatment trains designed to convert reclaimed water into potable water. Individual components include microfiltration, reverse osmosis, advanced oxidation and activated carbon. Thus, technologies to remove microplastics from potable water or effluents can easily be evaluated.

WEST is positioned to be a world leader in microplastics research.