



**ANALYZING
MICROPLASTICS
A MACRO
ENVIRONMENTAL RISK**

Resources and Solutions for Analyzing Microplastics

Microplastics and Their Sources: A Threat to Our Environment

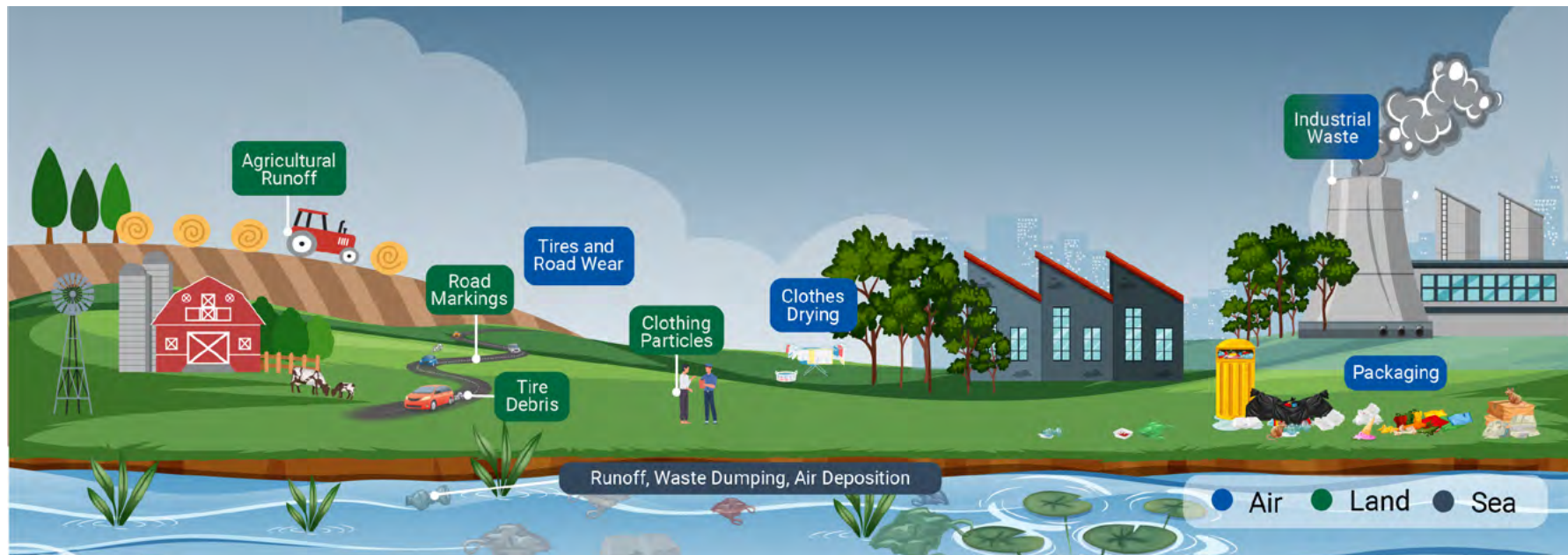
Each year, approximately nine million tons of plastic enters our lakes, rivers, and oceans from land-based sources. These materials persist in the environment where they break down into smaller pieces called micro- and nanoparticles.

Microplastics are divided into two types – primary and secondary. Primary microplastics enter the environment directly. They include microbeads found in personal care products, plastic pellets used in industrial manufacturing, and plastic fibers used in synthetic textiles.

Secondary microplastics are created from the breakdown of larger plastics. Typically, the larger plastics undergo weathering when exposed to wave action, wind abrasion, and ultraviolet radiation.

Unfortunately, microplastics are not biodegradable and can accumulate in the environment for hundreds of years.

Sources of Microplastics



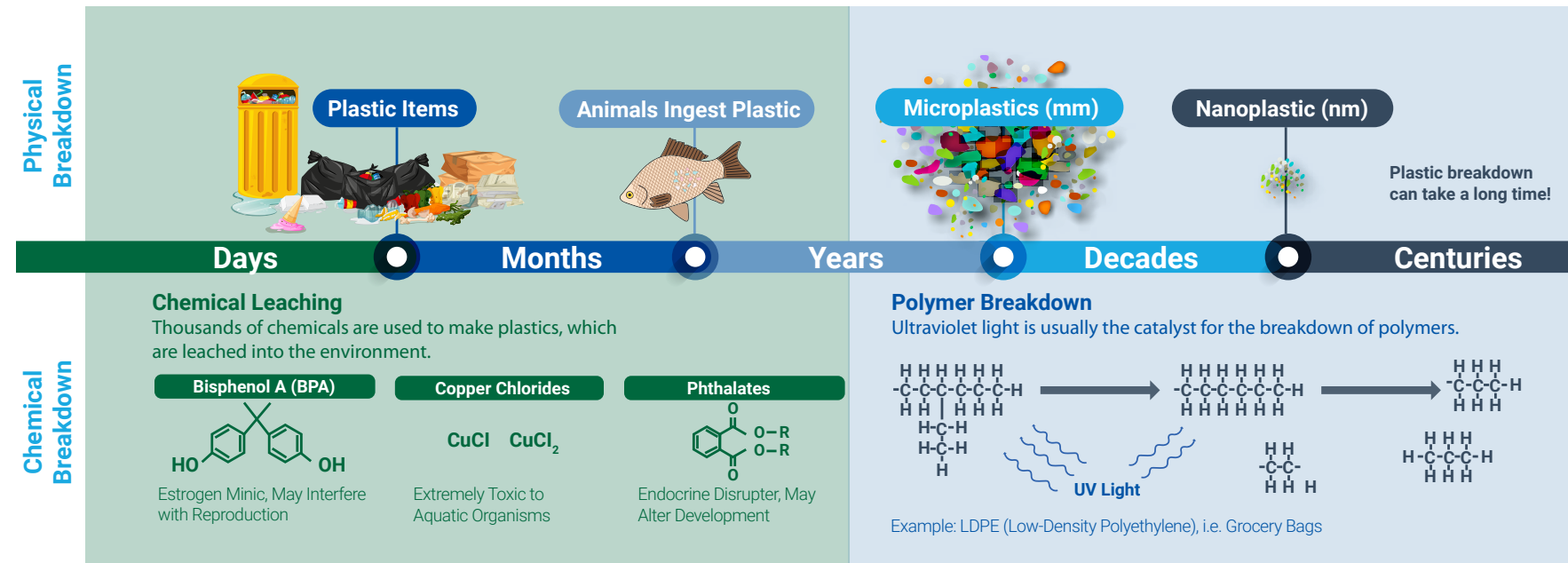
Microplastics: Environmental Effects and Future Impacts

Microplastics consist of carbon and hydrogen atoms bound together in polymer chains. Other chemicals, such as phthalates, polybrominated diphenyl ethers (PBDEs), and tetrabromobisphenol A (TBBPA), can also be present. Many of these chemical additives can leach out of plastics once they enter the environment.

In addition, microplastic particles have been found in more than 114 aquatic species, from zooplankton and small fish to larger marine predators and birds. Research continues to determine the effects chemical pollutants and plastic particles have on environmental and human health.

The Breakdown of Microplastics

There are many different types of plastics, each with a unique structure and chemical composition. Plastic breakdown is divided into two processes – chemical and physical.



Taking Control of Microplastic Pollution

Between 1950 and 2015, approximately 6,300 million metric tons of plastic waste were generated. Researchers estimate that by 2050, the amount of plastic waste in landfills and the environment will reach 12,000 million metric tons.

To raise awareness of the potential dangers of plastic pollution, organizations such as the United Nations Environmental Programme have engaged in educational campaigns in more than 100 countries, encouraging the reuse and recycling of plastics.

In 2015, the US passed the Microbead-Free Waters Act, which prohibits the manufacturing and distribution of rinse-off cosmetics products that contain plastic microbeads. Many other countries have followed suit.

There are also numerous international research efforts underway to better understand the flow of microplastics through the ecosystem and the potential impacts. Efforts to create a circular economic solution, focused on recycling and reusing plastics, rather than discarding them, are also underway in many part of the world.



The Environmental Impact of Microplastics: Part 1

View our infographic to discover the challenges and solutions of microplastics in our lakes, rivers, and oceans.



The Environmental Impact of Microplastics: Part 2

View this infographic to learn all about how microplastics enter the air and the affects they have on human health.

Analyzing Microplastics: Methods and Solutions

With our proven methods, you can detect, measure, and work towards eradicating the threat of microplastics in our environment. Explore our application notes and case studies to learn more.



Learn about FTIR imaging analysis of microplastic samples. ▶



Learn more about growing concerns over microplastics in water. ▶



Read about the analysis of microplastics in suspended solids with TG-GC/MS. ▶



Discover the advantages of mid-IR spectroscopy for polymer recycling. ▶



See how FTIR is used to detect microscopic microplastics in bottled water. ▶



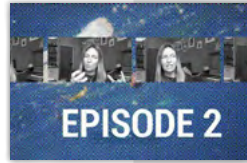
Learn how to identify polymers using our mid-infrared analysis system. ▶

Insights from the Experts

Explore our resources to gain valuable insights from key opinion leaders and experts in the microplastics industry.



Read this article on teaching the world about mismanaged plastics. ▶



Watch this video Q&A with Professor Pennie Lindeque, Plymouth Marine Laboratory, UK to get a macro view at microplastics in water. ▶



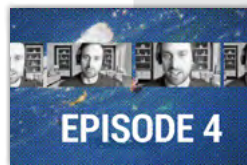
Read our case study: University of Birmingham Team Uses Agile TGA-FTIR-GC/MS Workflow to Advance Microplastics Research. ▶



Watch a video Q&A with Dr. Jose Isagani Janairo, Professor of Biochemistry, De La Salle University, Philippines to learn more about how microplastics affect ocean life and contaminate our seafood. ▶



Watch a video about researching plastics in the environment. ▶



Watch a video Q&A with Dr. Scott Coffin, California State Water Resources Control Board, and learn about regulating microplastics to mitigate macro risks. ▶



Watch our webinar to learn more about detecting microplastics by single particle ICP-MS. ▶



Read the Norwegian Institute for Water Research customer spotlight to learn about the presence of microplastics in the Arctic Ocean. ▶

Solutions for Analyzing Microplastics

When it comes to microplastics analysis, our advanced technologies, full solutions, and helpful resources provide the support you need for fast, accurate testing. Explore our technologies below.

Spectrum Two FTIR Spectrophotometer

The Spectrum Two™ system breaks ground in operational simplicity, combining superb performance with low-maintenance design. Extremely versatile, this system is capable of handling a wide range of applications. Plus, the level of performance can be configured to meet the demands of your daily IR analyses.

Key Features:

- Standard, high-performance, room-temperature LiTaO₃ (lithium tantalate) MIR detector with a SNR of 9,300:1
- Optional temperature-stabilized, high-performance DTGS (deuterated triglycine sulfate) MIR detector with a SNR of 14,500:1. Ideal for low-light, high throughput applications
- Standard optical system with KBr windows for data collection over a spectral range of 8,300 – 350 cm⁻¹ at a best resolution of 0.5 cm⁻¹
- Optional ZnSe windows, for use in exceptionally humid environments for data collection over a spectral range of 6,000-550 cm⁻¹
- Standard AVC with optional APV/AVI configuration

See additional features and get more information about our Spectrum Two FTIR spectrophotometer.



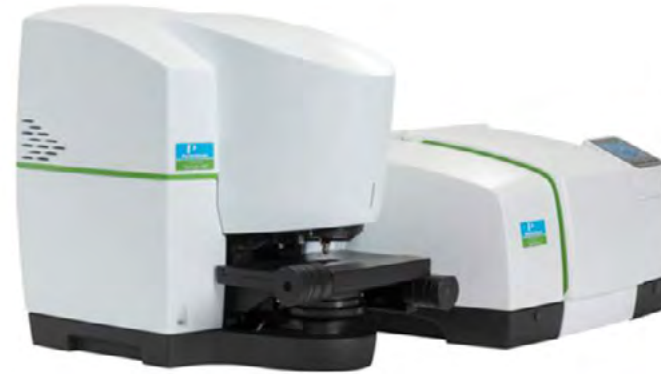
Spotlight 400 FTIR Imaging System

Our Spotlight™ 400 FTIR imaging system is designed with state-of-the-art technology that delivers intelligent automation and sophisticated analysis capabilities. The system incorporates several unique productivity tools, and it features an ATR imaging system that enables the collection of high-resolution infrared images of extremely small samples.

Key Features:

- High-quality spectral production and images from sample areas, yielding pixel resolutions of 6.25, 25, or 50 microns
- Region of interest (ROI) allows for streamlined analysis of multiple particles and layers all at once
- Dual-mode single-point and mercury-cadmium-telluride array (MCT) detector is standard with InGaAs array option for optimized NIR imaging
- Micro-ATR objective with a choice of a silicon or germanium crystal
- ATR standard spot and large spot imaging objective with a germanium crystal with automatic switching between wide area survey and high-definition imaging modes
- SpectrumIMAGE™ software as standard enabling full operation and image analysis

See additional features and get more information about our Spotlight 400 FTIR imaging system.



Single Particle ICP-MS

Characterizing nanoparticles with conventional, manual techniques can take hours. However, the NexION® ICP-MS single particle analyzer is uniquely equipped to handle the challenges of nanoparticle detection and nanomaterial research, delivering the specificity, resolution, and sensitivity required to ensure fast, reliable results.

Key Features:

- A single particle analyzer with proprietary software and best-in-class data acquisition rates (100,000 points/sec)
- Particle concentration, composition, size and distribution, dissolution and agglomeration tracking in a single run
- Patented real-time signal processing for instant differentiation between ionic and particulate fractions
- Full characterization in 60 seconds or less



Hyphenated Technologies

When you hyphenate thermogravimetric-infrared-gas chromatography/mass spectrometry (TG-IR-GC/MS), you create a powerful approach to analyze unknown mixtures, determine their primary components, and identify additives or contaminants. Our TG-IR-GC/MS high-fidelity heated transfer system offers the flexibility to switch from TG-IR-GC/MS mode to TGA, IR, GC/MS and/or GC mode quickly and easily.

Key Features:

- Maintains the relationship between the temperature each gas is released at and its corresponding components through FTIR
- The sequential measuring of off-gas components by GC/MS enables detection of trace levels too low to be seen in the FTIR
- GC capable with the Clarus® 690
- Benefits of using a fast GC include:
 - Time saving by up to 80%
 - Analyzing multiple events in a single run
 - Achieving double-event separation
 - Automatic triggering by time or weight loss



Your Ally in the Lab



OneSource Laboratory Services has built a complete suite of solutions that provide the knowledge, applications, services and human power today's labs need, including uptime optimization, lab analytics and workflow solutions. Digital innovations give you access to real time reports that help you make informed decisions about your lab. And compliance issues are avoided with guidance from experts who have worked with companies like yours.

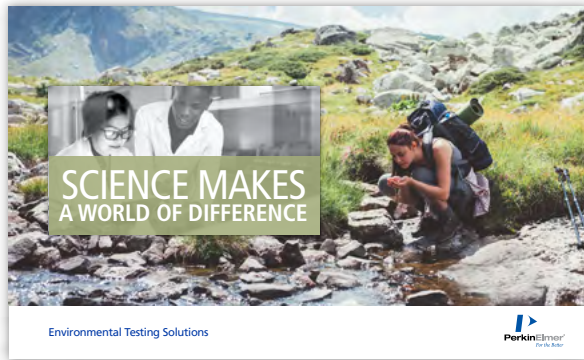
OneSource Services will ensure that your lab runs at maximum efficiency, returning time to your scientists to do what they do best.

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Environmental Solutions

Explore our brochures to learn more about our environmental testing capabilities and offerings – from soil to water to air.



Environmental Testing Solutions Brochure



Tools and Technologies for Environmental Analysis



Drinking Water Analysis Brochure



Soil Testing Solutions Brochure



Outdoor Air Monitoring Solutions Brochure



Drinking Water Analysis Webinar Series



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