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NewFields Note

The Basics of Microplastics

Forensic Application of Physical and Chemical Characteristics

NewFields Note: Technical information in a condensed, easily digestible format that is intended to promote environmental science education, knowledge transfer, and empowerment … *one note at a time.*

Microplastics (MP) are an emerging contaminant causing a range of human and ecological health issues. Since WWII, plastic production has increased from 50 million tons to over 400 million tons per year. This mix includes about 5,000 different additives added to improve the final product. Once plastic enters the environment, it starts to degrade, forming increasingly smaller pieces, leach additives and other breakdown products, and sorb other environmental contaminants.

Forensic Applications:

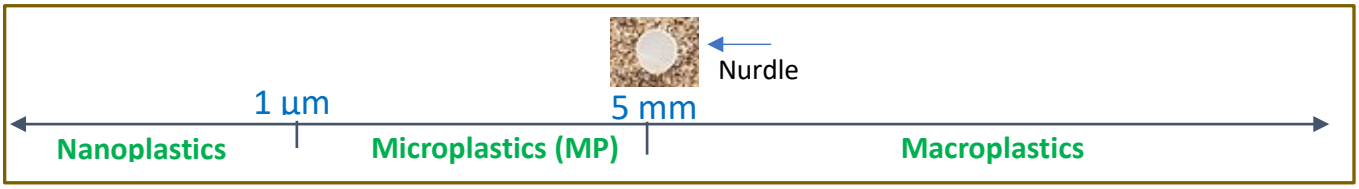
For physical characteristics:

- Accumulation in soil/ sediments from urban runoff/ wastewater discharge points
- Quantifying particle load in water

For chemical characterization:

- Determining the polymer type and additives to find the original material, age, and source location of the plastic.

Plastics can be tracked by their **physical characteristics**: color, shape, size, and density. Plastic ranges in size from macroplastic to MP to nanoplastic, with MP ranging from 5 mm to 1 µm. There are primary and secondary MP. Primary MP are plastic products that were initially made in that size range, such as pre-production pellets (aka nurdles) or microbeads in personal care products. Secondary MP are created from the physical breakdown of larger plastic products. As plastic breaks down, it will follow a shape morphology: fibers from clothing will form shorter fibers and other plastic objects will breakdown into smaller fragments. If dealing with point source plastic pollution, the physical characteristics can be a powerful tool for tracking those releases and accumulation. In another instance, the presence of plastics in sediment cores near wastewater treatment plants has increased over time, both with the increase in plastic production and with increasing output from the facility.



Chemical characterization of environmental plastics beyond polymer identification is a complex and rapidly evolving endeavor. The complexity of identifying these mixtures stems from the variety and volume of products produced, changes in additives used over time, and the transport mechanisms that can move plastics great distances and promote commingling. Large amounts of data can be gathered from both chemical extraction and thermal analysis of plastics. On-going research by NewFields has the goal to fingerprint plastics, by identifying the compounds in plastic that provide the specificity to distinguish plastic sources, analogous to what has been achieved with other contaminants like PAHs, PCBs, and petroleum.

For additional information, please contact your NewFields Technical Lead. Or send us an email at Science_Info@newfields.com! https://www.newfields.com