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## Fourier-Transform Infrared Spectroscopy of Environmentally Weathered Textile Fabrics for Enhanced Microplastic Identification

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Microplastic pollution in oceans is among the global environmental concerns of our time. Emerging research on ocean environments indicates that microfibers, such as those originating from textiles, are some of the most commonly occurring type of microplastic contaminants. While Fourier-transform infrared spectroscopy (FTIR) is commonly used to identify and characterize pollutant samples obtained from the environment, this identification is challenging because infrared spectra of materials can be modified by exposure to the ocean, air, UV light, and other ambient conditions, in a process referred to as “weathering”. We report preliminary efforts in improving FTIR characterization of microplastics by building a library of infrared spectra of common textile fibers weathered under a selection of ambient conditions. Consumer textile materials including polyester, nylon, cotton, and other, were exposed to a selection of ambient conditions: ocean, air, and wastewater treatment stages, in a controlled weathering experiment. Infrared spectra were monitored for up to 52 weeks, with the resulting data illuminating on the environmental fate and longevity of synthetic and natural fibers. Spectral changes caused by weathering were found to depend strongly on both the composition of the material and the specific ambient conditions. This library of weathered material spectra is useful not only in easier identification of environmental microfibers, but also in helping us estimate the duration and manner of weathering that a given environmental microfiber may have experienced.