An Automated Approach to Microplastic Analysis Using Infrared Mapping

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1 Abstract

The accumulation of microplastic pollution as a result of human activity is a significant threat to coastal ecosystems around the world. Microplastics, defined to be any plastic particle between 10 and 5000 microns in diameter, have been isolated from ocean water, beaches, and even intertidal wildlife. Though methods have been developed to filter microplastics out of many different types of samples, characterization of collected particles at a practical rate remains a significant challenge. Complete analysis of microplastic rich filter residue typically requires the collection of an infrared map followed by principle component analysis and spectral library searching. This process allows both the size and plastic type of particles to be determined, but has traditionally been too slow for practical use with single detector instruments. The introduction of specialized instruments equipped with focal plane array (FPA) detectors has greatly reduced the time required to collect infrared map data, but the prohibitive cost of such systems puts them out of reach for many research groups. Here, a new method is presented that allows a single detector instrument to collect infrared map data at a practically useful rate. This is accomplished through the use of software-based image processing to automatically recognize particles that are different from the background and collect map data around only those points. To assess the performance of this system compared to the collection of a complete map, seeded samples were filtered onto a 25mm diameter gold-coated membrane filter and analyzed using both methods. Only a minor loss of resolution was observed using the method proposed here.