Filtration of Microplastics in Aqueous Environments Using Ultrasonic Acoustics

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Microplastics are of much environmental concern due to its pollution of waterways and its impact on various aspects on ecosystems. While water treatment plants are effective at filtering most microplastics, particles of sizes below a certain limit often escape and enter the environment through treated wastewater. This project explores the possibility of applying ultrasonic acoustics to filter a large range of microplastic particle sizes, specifically targeting the small end of the spectrum that often escape current filtration methods. As ultrasonic waves are applied to a suspension sample through a 3D-printed hologram plate, translational motion of the particles is induced, resulting in a controlled collective flow toward a desired location within the apparatus where they are passively filtered through a micron sieve mesh. The efficiency of the concept on various particle sizes and types was measured using ratios of the filtered to sample concentrations. Statistical analysis was performed using one-tail tests and confidence intervals. While there was not a significantly lower concentration of escaped microplastics, an ultrasonic acoustic filtration system has the potential to contribute to the global movement committed to reducing microplastic contamination.

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