Name(s)
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Project Number
S1121

Project Title
Microplastics, Macro Problem: A Novel Technique to Remove Microplastics from Water Using a Modified Electrostatic Filter

Abstract

Objectives/Goals
Microplastics are an increasingly problematic aspect of plastic pollution with an estimated 83% presence in tap water worldwide. Currently, there are no feasible water treatment options to remove microplastics from water that are both effective and economical. After learning of the beneficial effects electrostatic smoke precipitators have on ash removal in power plants, I applied concepts found in these filters and applied them to a novel microplastic filter. My hypothesis was that a stronger charge of the electromagnets used in my filter design would remove more microplastics from the water.

Methods/Materials
To test this, I constructed five variations of filters, each having two pieces of mesh attached to electromagnets. Each filter had electromagnets at different strengths, dependent on the number of coils. The five filters tested had varying numbers of coils of 0, 50, 100, 150, and 200. To determine the filters' effectiveness on different sized microplastics, I tested my filters with two different sized microplastics of 1058.330 microns and 264.583 microns. After constructing the filters, I used a 9V battery as the power source to charge the electromagnets. I then filtered one gram of microplastics suspended in 200mL of distilled water through each filter for five trials, doing this for each of the two different microplastic sizes.

Results
The data from the tests proved my hypothesis correct and consistently showed a positive relationship between the strength of the electromagnets and the amount of microplastics captured. The data shows that the filter with 200 coils on the electromagnet filtered an average of 24.5% of the large microplastics and 14.88% of the small microplastics, while the filter with no electromagnetic strength removed 1.7% of the large microplastics and 0.6% of the small microplastics.

Conclusions/Discussion
This research proved a way to successfully filter out microplastics from water using pre-existing and low-cost technology. There was a direct correlation between the strength of the electromagnet and amount of microplastics captured. Given that a 9V battery was the power supply used, it is logical that a stronger power source would remove more microplastic. This research shows potential in both commercial and industrial levels, with potential applications in a variety of settings, from household appliances to large-scale water treatment facilities.

Summary Statement
I created a novel electrostatic water filtration technique that removes microplastics from water.

Help Received
None. I designed, built, and performed the experiments myself.