Name(s)

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Project Number

J1112

Project Title

Utilizing Magnetic Fields and Activated Carbon to Develop a Novel Microparticle Filtering System

Abstract

Objectives

The world s waters are continuously being contaminated and polluted by microplastics and microfibers with almost 30% of marine pollution coming from microplastics and microfibers alone. As of the present day, there is a lack of filters in the world that focus specifically on filtering these microparticles. In order to take action to reduce this microparticle pollution, the purpose of my experiment was to develop a microplastic and microfiber filtration system that was both cost-effective and efficient. Based on my research, I hypothesized that a filtration design that incorporated a mesh filter, a magnetic field, and a layer of activated carbon would be most effective in removing microcontaminants from tap water.

Methods

Three variations of filters were designed; a 0.7mm mesh filter, a magnetized mesh filter, and a magnetized carbon mesh filter. Separate samples of tap water were contaminated with a set amount of microplastics and microfibers and the mixtures were blended to disperse the microparticles evenly throughout the liquid. Then, 150µL samples of the mixtures of microparticles and tap water were passed through each filter and analyzed in petri dishes using a compound microscope under 40X magnification.

Results

The results indicated that the magnetized carbon mesh filter yielded the best results, then the magnetic mesh filter, and finally the mesh filter. The magnetic carbon mesh filter removed about 94.12% of the microplastics and 92.07% of the microfibers. Then, the magnetic mesh filter filtered about 82.03% of the microfibers and 54.01% of the microfibers. Finally, the mesh filter was able to remove about 51.96% of the microplastics and 23.37% of the microfibers. Thus, my hypothesis that the magnetized carbon filter would remove the highest amount of microplastics and microfibers was supported by the above results.

Conclusions

Altogether, this experiment helped me successfully design a cost-effective and extremely efficient microparticle filtration system. The utilization of a magnetic field as well as a layer of activated carbon proved very instrumental to the effectiveness of the filter. My next goal is to have the principles behind my filter designs implemented into household drainage systems and other drainage systems around the world so that eventually, we can eliminate the presence of these toxic contaminants within our aquatic environments.

Summary Statement

Through the utilization of magnetic fields and activated carbon, I designed and tested a microparticle filtration system that was able to remove more than ninety percent of contaminants from tap water.

Help Received

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