An Investigation into the Removal of Microplastics from Water Using Ferrofluids

Ferreira, Fionn (School: Schull Community College)

This project investigates a new method for the extraction of microplastics (plastic particles less than 5mm in diameter) from water. Currently, no screening or filtering for microplastics takes place in any European wastewater treatment centres. This method was inspired by an article by Dr Arden Warner, who used non-toxic iron oxide (magnetite) to clean up oil-spills. I used this method to extract microplastics from water, by adding oil to a suspension containing a known concentration of microplastics. After these migrated into the oil phase, magnetite powder was added. The resulting microplastic-containing ferro-fluid was removed using strong magnets. The hypothesis was that this extraction method would remove 85% or higher of microplastics in samples. To measure the concentration of microplastics in a given sample, I built a visible light spectrometer which analysed the spectra of light passed through samples using the software, Spectragryph. This used the Beer Lambert law to determine the concentration of each sample. Samples were also examined using microscopy and analysed in Adobe Photoshop. Both testing methods gave a measurement of the plastics removed. The 10 most commonly found microplastics were used in tests. All plastic samples used were prepared before extraction. The subsequent results supported the hypothesis, with an average of 87.6% ± 1.1% extraction. The method used was most effective on fibres obtained from a washing machine, and least effective on polypropylene plastics. I conclude that my method could form the basis for an effective method of microplastic extraction from water.

Awards Won:

Second Award of $2,000

Drug, Chemical &amp

Associated Technologies Association (DCAT): First Award of $3,000.

American Statistical Association: Certificate of Honorable Mention

American Chemical Society: First Award of $4,000

University of Arizona: Tuition Scholarship Award