



Student Develops Effective Water Filter to Combat Microplastics

Description

A high school student in Virginia has successfully developed a filtration system that eliminates over 95 percent of microplastics from drinking water. This innovation employs a magnetic liquid known as ferrofluid to extract tiny plastic particles from water without using conventional filter membranes.

The emergence of microplastics, which are synthetic particles measuring between 1 nanometre and 5 millimetres, has garnered increasing concern, as they have been detected in various environments, including oceans and human organs. Although research continues into their health impacts, their pervasive presence is worrisome.

In Warrenton, Virginia, reports of water contamination, specifically due to polytetrafluoroethylene substances (PFAS) and microplastics, prompted residents to seek personal solutions for water filtration. This situation motivated Mia Heller, a student at Kettle Run High School, to explore alternative filtration methods.

Heller began her project at home, where her family had previously used a filtration system that required frequent maintenance. Frustrated by the need for constant filter replacements, she aimed to create a simpler and more efficient solution. Her invention evolved into a three-chamber system that separates water, ferrofluid, and microplastics, utilising a magnetic field to extract contaminants from the water. Importantly, the ferrofluid can be reused, eliminating the need for disposable components.

The alarming spread of microplastics is reflected in research that reveals their presence in over 1,300 species and even human tissues, including the brain and bones. A University of New Mexico study indicated a 50 percent increase in microplastic levels in human brain samples within a decade, raising questions about potential health risks.

Heller's prototype achieved a remarkable 95.52 percent removal rate of microplastics while reclaiming 87.15 percent of the ferrofluid. These results place her system on par with traditional water treatment plants, which typically eliminate between 70 and 90 percent of microplastics. However, challenges remain regarding the safe disposal of collected microplastics and the cost of producing ferrofluid at scale.

Heller envisages her system as suitable for domestic use, specifically under kitchen sinks, rather than in large treatment facilities. She plans to have her findings validated by professionals before determining the next steps in her project.

Vocabulary List:

1. **microplastics** //,maɪkroʊˈplæstɪks// (noun): very small pieces of plastic in water
2. **ferrofluid** //ˈfɛrəʊˌfluɪd// (noun): a liquid with magnetic particles inside
3. **filtration** //fɪlˈtreɪʃən// (noun): removing unwanted particles from a liquid



4. **contaminants** //kən'tæmɪnənts// (noun): things that make water dirty or unsafe
5. **prototype** //ˈprɒʊtə,taɪp// (noun): an early working model of a device
6. **disposal** //dɪ'spəʊzəl// (noun): getting rid of waste or unwanted materials

Comprehension Questions

Multiple Choice

1. What percentage of microplastics can the filtration system developed by the student eliminate?
Option: 90 percent
Option: 95 percent
Option: 95.52 percent
Option: 70 percent
2. What substance does the filtration system use to extract microplastics from water?
Option: Water
Option: Ferrofluid
Option: Polytetrafluoroethylene
Option: Magnetic field
3. What was the primary motivation for Mia Heller to develop her filtration system?
Option: Research purposes
Option: Personal water safety
Option: Dissatisfaction with existing systems
Option: Environmental protection
4. In what state did Mia Heller develop her filtration system?
Option: California
Option: New Mexico
Option: Virginia
Option: Texas
5. What is the size range of microplastics?
Option: 1 nanometre to 5 micrometres
Option: 1 micrometre to 5 millimetres
Option: 1 nanometre to 5 millimetres
Option: 1 millimetre to 5 centimeters



6. What percentage of ferrofluid can Heller's system reclaim?

Option: 95.52 percent

Option: 87.15 percent

Option: 50 percent

Option: 70 percent

True-False

7. Mia Heller's filtration system was developed at Kettle Run High School.

8. The filtration system uses conventional filter membranes to operate.

9. Microplastics have been found only in oceans, not in human organs.

10. PFAS substances prompted residents in Warrenton to seek personal solutions for water filtration.

11. Heller's prototype is less effective than traditional water treatment plants.

12. Heller plans to develop her system for use in large treatment facilities.

Gap-Fill

13. The filtration system eliminates over 95 percent of _____ from drinking water.

14. The student used a magnetic liquid known as _____ to extract tiny plastic particles.

15. Microplastics are synthetic particles measuring between 1 nanometre and _____.

16. Heller's project achieved a removal rate of microplastics of _____ percent.

17. The existing filtration system required frequent _____, prompting Heller to innovate.

18. Heller's system can be reused, eliminating the need for _____ components.

Answer

Multiple Choice: 1. 95.52 percent 2. Ferrofluid 3. Dissatisfaction with existing systems 4. Virginia 5. 1 nanometre to 5 millimetres 6. 87.15 percent

True-False: 7. True 8. False 9. False 10. True 11. False 12. False

Gap-Fill: 13. microplastics



14. ferrofluid 15. 5 millimetres 16. 95.52 17. maintenance 18. disposable

CATEGORY

1. Health - LEVEL6

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