Where the Rubber Meets the Road: The Development of an Innovative, Reusable, and Energy-Efficient Filter for Microplastics Created Through Tire Wear

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The purpose of this project was to develop and test a reusable and energy-efficient device to filter microplastics (plastics under 5mm in size) created by tire wear. This research is important as tire wear accounts for up to 28% of microplastics in the oceans, makes up 3 to 7% of the particulate matter in the air, and U.S. tires alone produce about 1.8 million tons of microplastics every year. There is currently no realistic alternative tire design that does not produce microplastics. This project modified an electrostatic smoke precipitator design to create a filtration device. A series of 9-volt batteries were used as the power supply for this filter. For this experiment, a tire was run over a file for 35 seconds to simulate 412 feet of road wear, the filter was placed behind the tire, and a glass collection box was placed behind the filter. Afterwards microplastic particles in the collection box were counted. The results showed that the average number of plastic particles was reduced from 557 to 74 when the tire's airstream was not filtered versus when the 108V filter was used. This 87% reduction was the greatest of any voltage tested, with the 0V filter having a 1% increase, the 27V filter having a 57% reduction, the 54V filter having a 74% reduction, and the 81V filter having a 79% reduction in comparison to the non-filtered airstream. Based on these results, it can be concluded that this electrostatic filter is effective at addressing microplastic pollution created through tire wear.

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