Abstract

Plastics do not decompose; instead, they breakdown into microplastics (MPs). These MPs are present in the air we breathe, the water we drink, and the food we eat. MPs can also adsorb and transport multiple compounds that are harmful to the environment and human health. Using Gas Chromatography (GC) and Solid Phase Micro-Extraction (SPME) fibers, these adsorbed compounds can be analyzed. Understanding what compounds are adsorbed by MPs is critical as plastic waste continues to grow.

Objective

To determine what compounds are adsorbed by microplastics.

Background

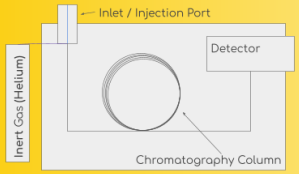


Figure 1. Sketch of a gas chromatography instrument.



Figure 2. Sketch of a fraction of a GC column (left) and its cross-section (right).

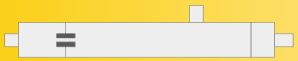
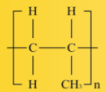


Figure 3. Sketch of a Time-Of-Flight Mass Spectrometry (TOF-MS) instrument.

Polypropylene (PP)



Polyethylene Terephthalate (PET)



Figure 4. Molecular structures of the MPs examined.

Results

Among many other harmful compounds, Formamide, Toluene, Anthracene, Cholesterol, & Pyrene were found in MPs of PP and PET.

Conclusions

Microplastics of PP and PET were found to adsorb hundreds of non-polar semi-volatile compounds. The level of toxicity of multiple compounds found in these samples raise various concerns regarding the role of plastic waste in terms of human and environmental health. Further research may involve studying the compounds adsorbed by other types of compounds analyzed through the use of Pyrolysis-Comprehensive GC-TOF-MS.

Special Thanks

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Methods











Figure 5. Photos of the MP samples in different environments. Top to bottom: Parking lot, laboratory, balcony, bedroom, blanks.



Figure 6. Image of a 30-µm (SPME) fiber for non-polar semi-volatile compounds.

References

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