2024

FT-IR: Detecting Microplastics in Drinking Water

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Alaska Space Grant Program
Science Technology Engineering Mathematics

This material is based in part upon work supported by NASA through the Alaska Space Grant Program (80NSSC20M0070).”

Microplastics in Alaskan Drinking Water

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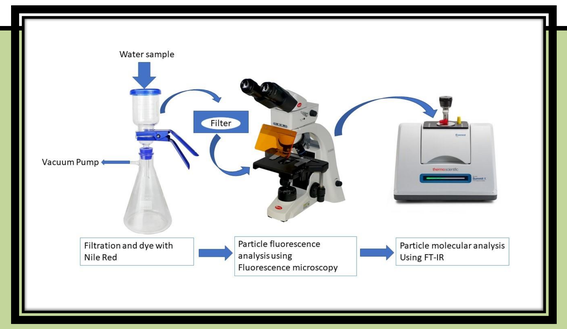
Introduction

Abstract
Microplastics contamination is a growing concern across the world as its impacts are newly being studied (Mao R et al. 2020). My interest lies in microplastic contamination across various water sources in communities across Alaska. Because of the isolated nature of many Alaskan cities the source of their drinking water varies from private well water, to municipal water, as well as water brought in via trucks. Because of these different origins and methods, the potential for Microplastic contamination is inconsistent among many communities. Water brought via trucks is most often stored in plastic containers for transport as well as use (Marino E et al. 2009).

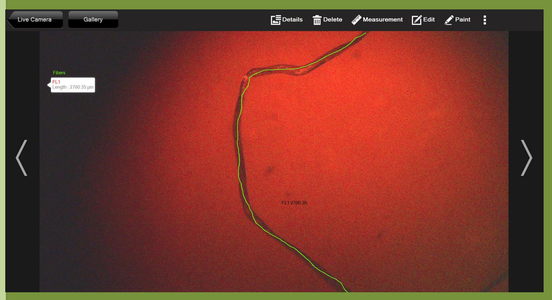
Procedure
As students and researchers at Alaska Pacific University we embarked to take a deeper look at microplastic concentration within Alaskan waters. We began by establishing control methods and control samples to adequately compare with test drinking water samples. We filtered water twice through cellulose filters (0.8 Micron) and a glass filter under pressure from a sink hose. As the test water was nearly completely filtered, we allowed approximately 1 mL of the sample water mixed with Nile Red dye to filter without pressure to dryness, allowing the dye to adhere to the microplastics. We then observed the samples under a fluorescence microscope to measure the microplastics and identify the morphology of the microplastics as pellets, fragments, or fibers. The analysis of the morphology we used throughout this project was based on (Nousheen et al. 2022). We then, using an FT-IR instrument, examined the chemical composition of the samples and identified them from the FT-IR library. We report our results of testing drinking water sources from a variety of rural and urban locations across Alaska.



Results

FT-IR scan of blue acrylic thread from Bethel sample 2

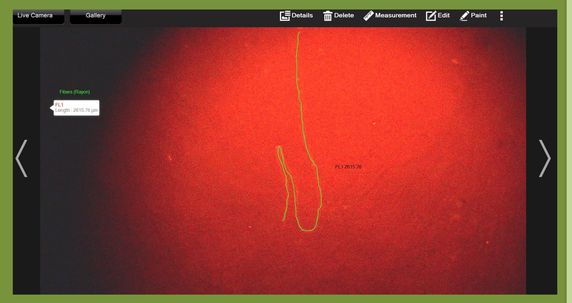
Blue nylon thread from Bethel sample 2 under fluorescent microscope



Blue acrylic thread from Bethel sample 2 under fluorescent microscope

FT-IR scan of blue nylon thread from Bethel sample 2

FT-IR scan of white rayon thread from Bethel sample 1



white rayon thread from Bethel sample 1 under fluorescent microscope

Conclusions

Relevance to NASA
NASA’s Earth Science Mission is concerned with human activities which have global environmental impacts on ecosystem and human health. Therefore microplastics proliferation which has become a world-wide concern to environmental stability and health is a concern to NASA. Many watersheds and Traditional Drinking Water and municipal drinking water sources have become contaminated, and if digested may cause health issues. Furthermore, astronauts are also likely exposed to microplastics contamination if their water source is contained in plastic.

Conclusions

- Bethel samples were the only samples in which we found confirmed microplastics
- Truck water samples contained significantly higher rates of particulate than municipal or well water
- Well water samples had considerably less particulate
- Well water and municipal water samples had smaller particles than truck water samples
- **Microplastics in drinking water needs to be monitored and mitigated**

References

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