Indoor Air Quality- Characterizing Emissions and Volatility of Particulate Matter from Cooking Oils

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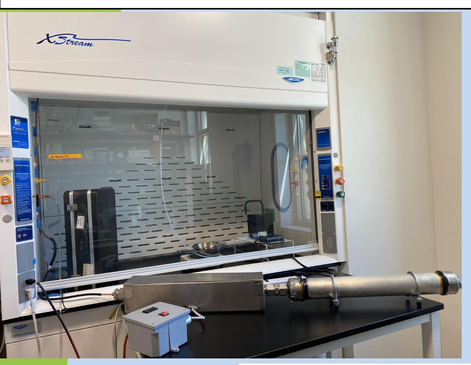
Research Experiences for Community College Students

CIRES

Methodology

The main oils that were tested were coconut, lard (animal fat), peanut oil, and vegetable oil. This project was completed with a frying pan in a fume hood. The oils were each poured in the frying pan at the designated temperatures: 21, 50, 75, 100, 150, 175 Celsius, respectively. The temperatures were set accordingly on the thermodenuder. The thermocouple measured the temperature of the oil, which was shown on the PID (black box; temperature controller). The thermodenuder was used to separate, remove, and measure volatile components of aerosol.

After that the remaining particles go through the SMPS (Scanning Mobility Particle Sizer) and APS (Aerodynamic particle sizer). Their jobs are to measure aerosol volume, particle size, and evaluate aerosol.



Results

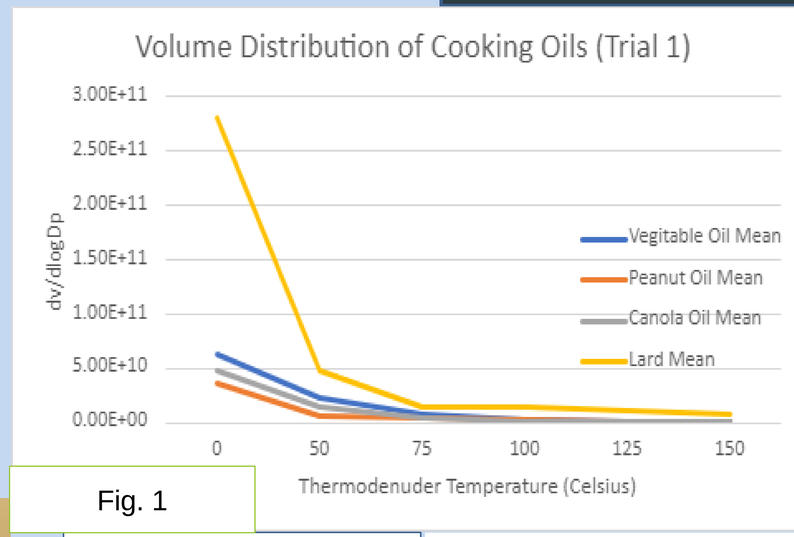


Fig. 1

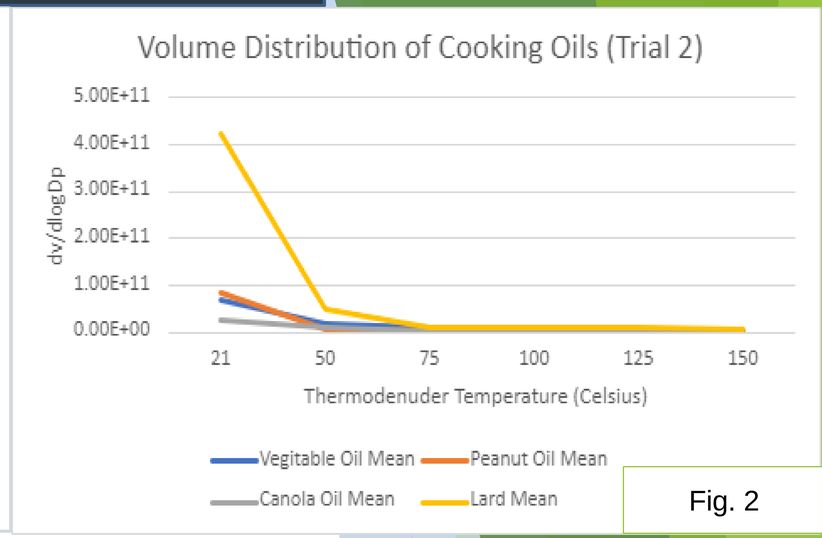


Fig. 2

-As temperature increased, oils evaporated into the air
-At 75 ℃, the volatile particles evaporate

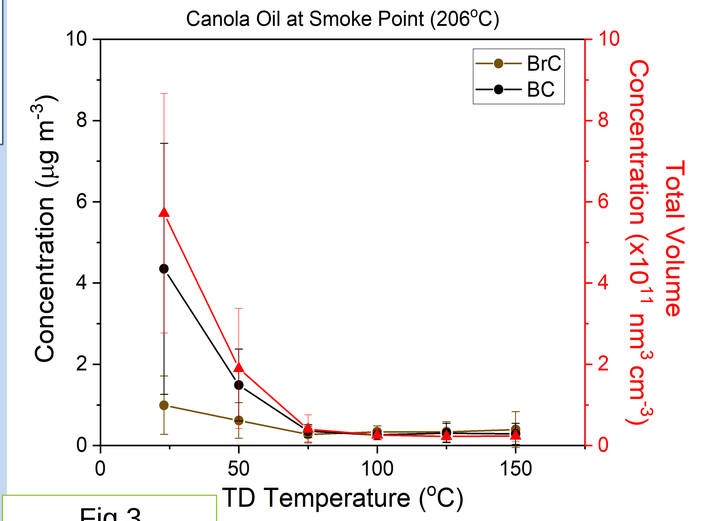


Fig 3

Here again at 75 ℃
Black Carbon (BC)
Brown Barbon (BrC)

Background

- High particulate concentrations have negative health effects. Particulate matters can be released from several objects, including household products and activities.
- These particles can travel by themselves or in aerosols and can affect human health, and the environment when released.
- The size, shape, and chemical composition of the particles can affect the environment and humans differently.
- For this experiment, we are investigating if particles are emitted from common household cooking oils and how much space they comprise.

Motivation

To further investigate if particulate matter (PM) are emitted from cooking oils that may affect human health. And to investigate the volatility of the particles. This includes the effects they may have in commercial and industrial kitchens. As well as the effects the volatile particles have on the atmosphere and the climate.

References

- Buonanno, G., Johnson, G., Morawska, L., & Stabile, L. (2011). Volatility characterization of cooking-generated aerosol particles. Aerosol Science and Technology, 45(9), 1069-1077.
- Nielsen, C., Kyeremeh-Dapaah, K., & Yanowich, P. (n.d.). *Design and Construction of a Thermodenuder for Conditioning Aerosols*.

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