SILYLATION AND ANALYSIS OF ORANGE OIL IN THE VERNIER MINI GC PLUS
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APPLICATIONS IN THE CLASSROOM

- 10 min: Grating orange peels.
- 5 min: Assemble reactor and place in microwave
- 5+2 min: 5 minutes microwave extraction, 2 minutes to cool down
- 3 min: Collect oil
- *20 min: Allow oil to react with MSTFA in heptane
- 10 min: Inject oil into Mini GC Plus and analyze with Logger Pro
- Total: 55 minutes (35 with MSTFA solution already available)

*By having pre-prepared orange oil/MSTFA solutions, this step can be omitted.

Experiments

Note: The orange oil used for all experiments was extracted using EssenEx-100 Microwave Extron.

Mini GC Plus A baseline of methanol and ethanol retention times and peak areas was obtained by running 0.1µL five times each. Methanol was also run at varying volumes from 0.05µL to 1.0µL to determine the resolution of the Mini GC.

1. Pure orange oil was run in the Mini GC at 150°C, 21kPa, and High Sensitivity at varying volumes from 0.1µL to 1.0µL. Ten runs were also conducted at 0.8µL and the retention times and areas were analyzed.

2. 100mg of orange oil was silylated using 100µL MSTFA in a solution of 3mL heptane for 20 minutes. The same tests conducted on pure orange oil were run on the silylated sample of orange oil for comparison of retention times and peak areas.

Discussion & Results
The retention time of Orange Oil decreased by over half after MSTFA was injected into the sample. Silylation of D-Limonene was successful despite the lack of an -OH group on D-Limonene. Successful analysis of orange oil provides an expansion of the capabilities of the Mini GC Plus. The decrease in time allows for a potential high school laboratory experiment.

Conclusion
Silylation of orange oil successfully increases its volatility for analysis in the Mini GC Plus. The objective of the research was achieved.

Future Work
Silylation and analysis of other essential oils in the Mini GC Plus, such as lavender and peppermint oil. Additional silylation-reagents for orange oil will be tested to optimize process for educational laboratory experiments.

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References
4. OilExTech. EssenEx™-100A.