Solid-Phase Microextraction Gas-Chromatography Mass Spectrometry of Furan in Coffee Grounds

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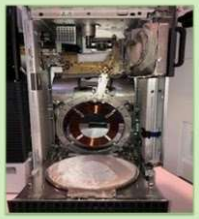
Introduction

Coffee is one of the world's most popular drinks with 400 million cups of coffee consumed daily in the United States. Furan is a heteroaromatic compound that is used as an intermediate in the production of many chemical compounds. Furan, formed during coffee roasting, is known to be toxic and carcinogenic, which leads this project to focus on the analysis of furan contents in K cups.

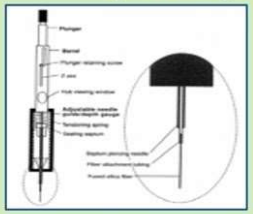
Furan

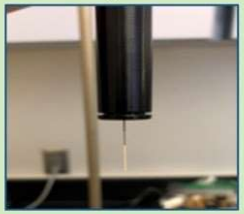
Solid Phase Microextraction (SPME) is a technique commonly used in sample preparation involving a fused-silica fiber that is coated with an absorptive stationary phase. The stationary phase causes the sample to adhere to the fiber. Gas Chromatography Mass Spectrometry (GCMS) is a hyphenated analytical technique combining Gas Chromatography and Mass Spectrometry. SPME GCMS is useful for furan compounds which are extremely volatile and easily lost with rigorous sample preparation techniques

Instrumentation



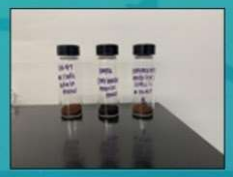
Agilent Technologies Intuvo 9500 GC System



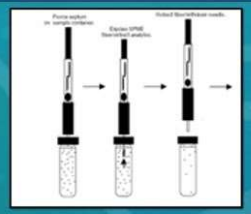


SPME SUPELCO PART 57328-U: 65µm Polydimethylsiloxane/Divinyl Benzene coating, Fused Silica core.

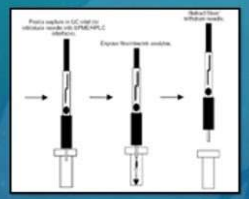
Samples were Frozen to Prevent Volatile Losses



1.Absorption



2. Desorption



3. GCMS Parameters

The inlet, oven and mass spectrometer parameters are shown for the GCMS. Utilizing these functions, the samples were able to be analyzed properly.

Results

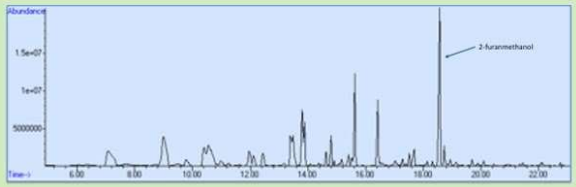


Figure 1. The chromatogram of Community America Breakfast Blend - Medium Roast with peaks of furan derivatives

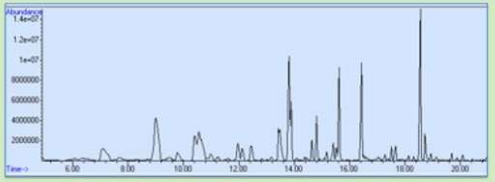


Figure 2. The chromatogram of McCafe Breakfast Blend Light Roast with peaks of furan derivatives

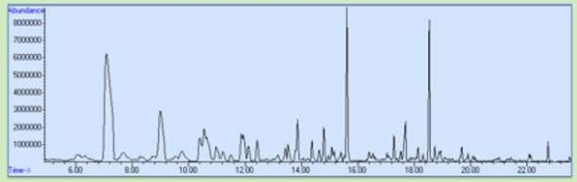


Figure 3. The chromatogram of Starbucks Dark French Roast with peaks of furan derivatives

Data / Conclusions

- 2-furanmethanol & 2-furanmethanol acetate were identified with high confidence and at significant concentrations in all coffee pods tested
- Other furan derivatives, including 2-furancarboxaldehyde & furfural were also found at high but varying concentrations in the pods.

Future Work

To utilize SPME GC-MS to further analyze furan contents within jarred baby foods, starting with carrots. Analysis of calibration and quantification methods will occur before starting new project.

Acknowledgements

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