Analysis of Alcohols in Hand Sanitizer and Impurities in Alcohol by GC-FID using Zebron™ ZB-624*PLUS*™ GC Columns

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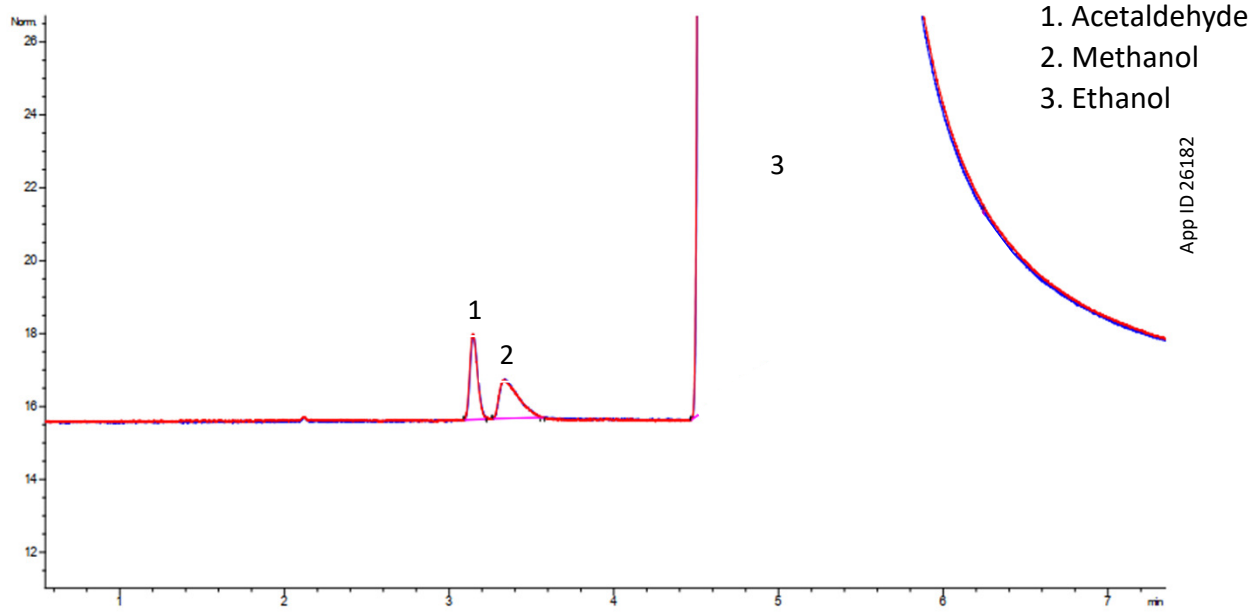
Overview

Alcohol-based hand sanitizers are used on a daily basis to kill microorganisms including bacteria. Alcohol-based sanitizers generally contains over 60% of alcohol. However, if the alcohols are not at the right concentrations, it becomes ineffective. Thus, quantitative estimation of alcohol % in hand sanitizer via GC-FID is a very important analysis for identifying and quantifying the alcohols and content in hand sanitizer for both quality and branding purposes. In addition, the quality of alcohol used as raw material is equally important to avoid adverse effects. In this application note, we have developed a GC-FID method for ascertaining the purity of raw material alcohol for impurity levels and quantitative method for % alcohol in hand sanitizer using a single method on a Zebron ZB-624*PLUS* GC Column.

GC-FID Conditions

Column:	Zebron ZB-624*PLUS*
Dimension:	30 meter x 0.32 mm x 1.80 µm
Part No.:	7HM-G040-31
Injection:	Split 20:1 @ 200 °C, 1 µL
Recommended Liner:	Zebron PLUS Z-Liner™ (Compatible with Agilent® & Thermo® GC instrument)
Liner Part No.:	AG2-0A03-05
Carrier Gas:	Helium @ 25 cm/sec (Constant Flow)
Oven Program:	36 °C for 12 min, 260 °C @ 10 °C/min for 15 min
Detector:	FID
Detector Temperature:	280 °C

Figure 1. 50 ppm Acetaldehyde and 50 ppm methanol in 99.5% ethanol



Sample:
1. Acetaldehyde
2. Methanol
3. Ethanol

App ID 26182

Figure 2. 100 ppm Acetaldehyde and 100 ppm methanol in 99.5% ethanol

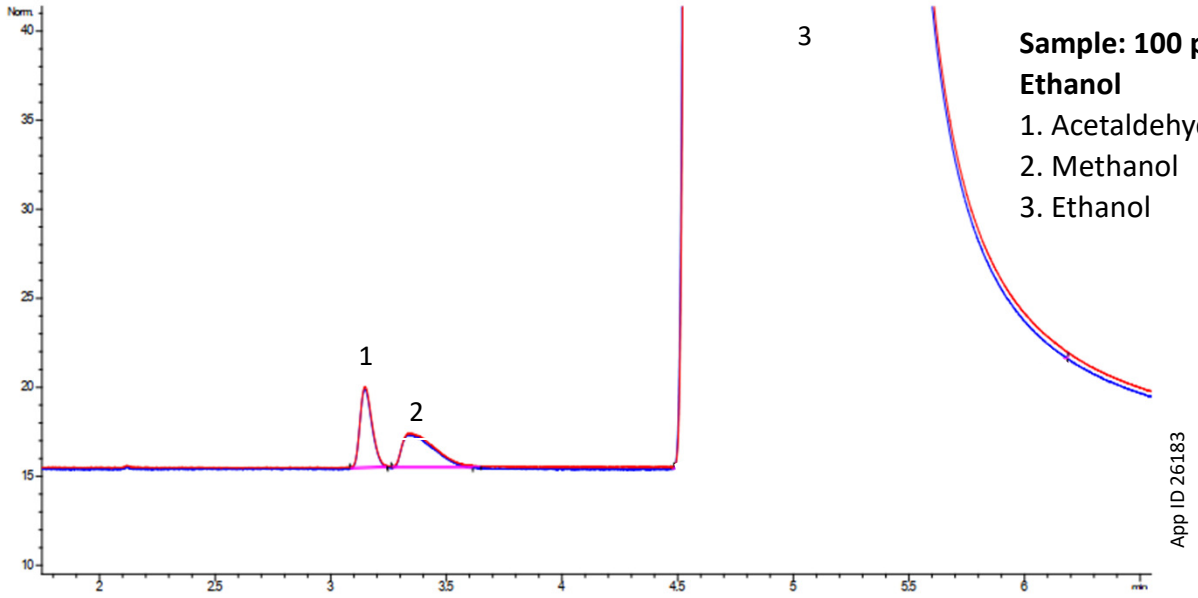


Figure 3. 200 ppm methanol in 99.5% ethanol

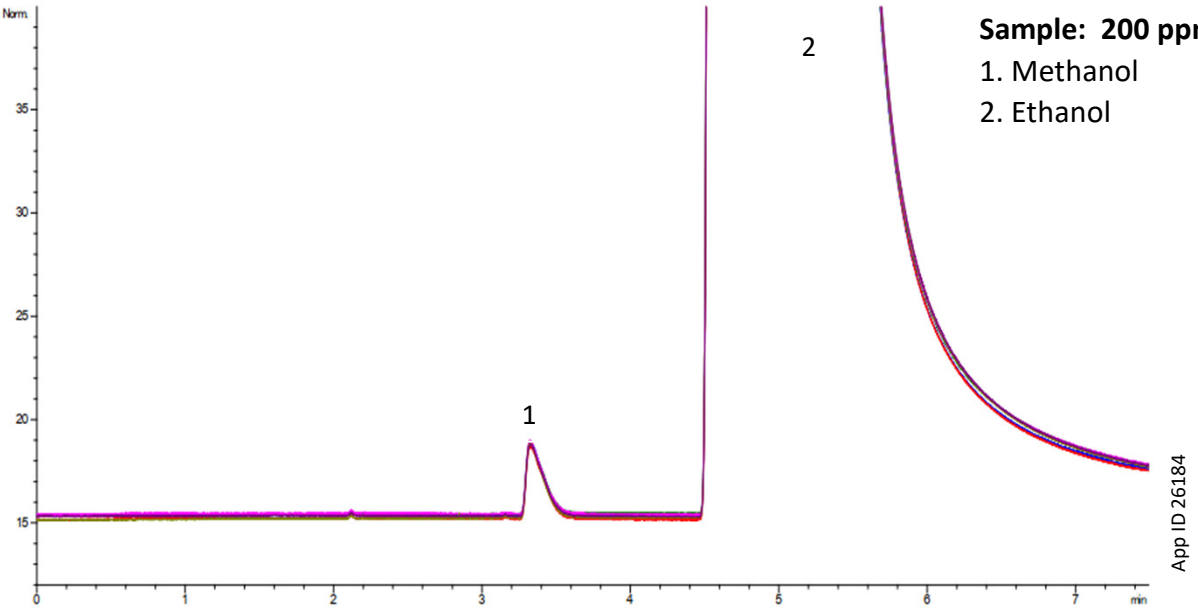


Figure 4. USP impurities in 99.5% ethanol

Sample: Impurities in Ethanol
1. 50 ppm Acetaldehyde
2. 50 ppm Methanol
3. Ethanol
4. 2 ppm Benzene
5. 30 ppm Acetal
6. 60 ppm 4-methylpentan-2-ol

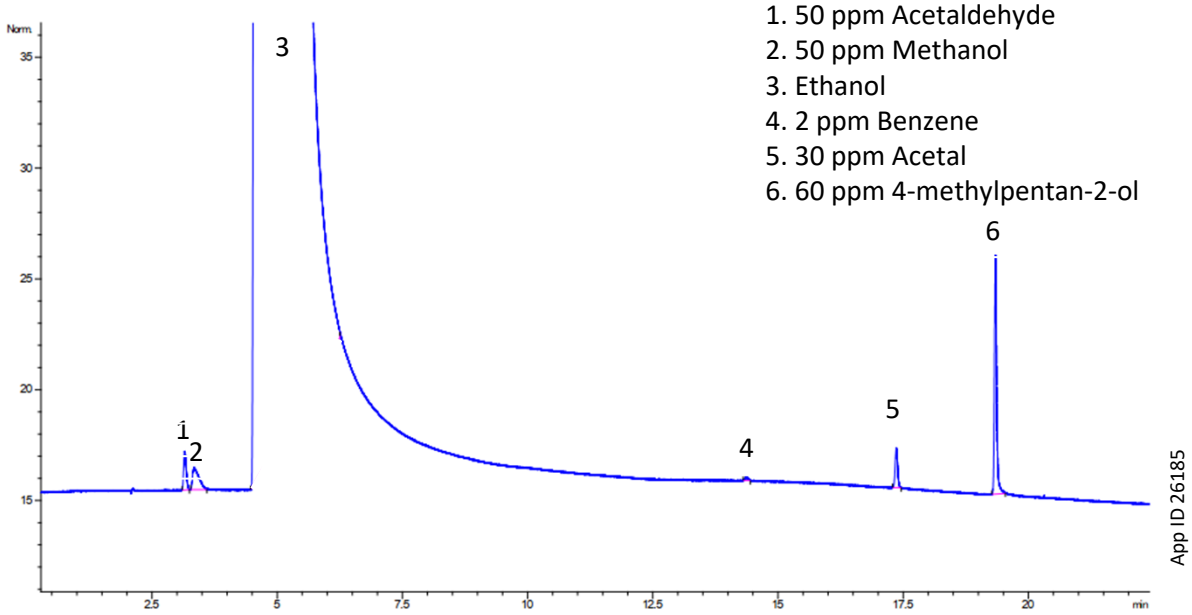


Figure 5. Analysis of % content of Alcohol in Hand Sanitizer

Sample: 31 mg/mL of Hand Sanitizer in DMF
1. Ethanol
2. Dimethylformamide - DMF (Diluent)

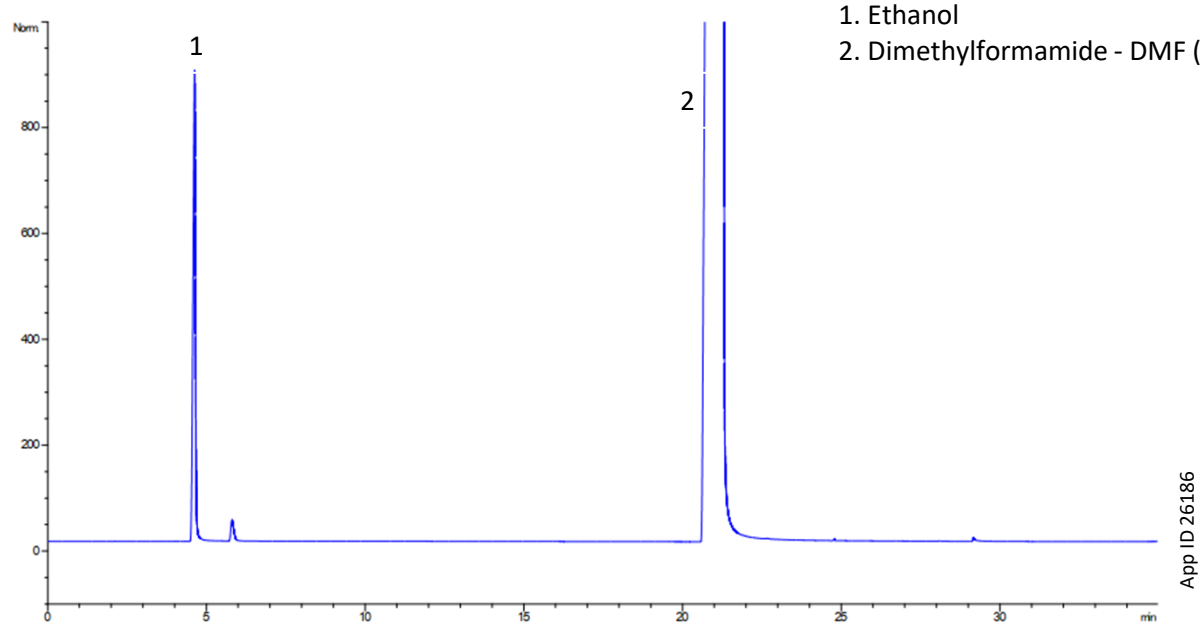


Table 1. Precision Data for Ethanol Content in Hand Sanitizer on a Zebron™ ZB-624*PLUS* GC Column

	Ethanol	
Injection #	Retention Time (min)	Peak Area
1	4.625	4719
2	4.627	4702
3	4.633	4650
4	4.630	4714
5	4.627	4633
6	4.626	4675
% RSD	0.1%	0.8%

Results and Discussion

Due to increased demand for alcohol-based hand sanitizers, there is a need for a fast and efficient GC method to accurately quantify the % of alcohol in hand sanitizer. In addition, it is very important to make sure that the raw material alcohol used in the sanitizer manufacturing meets safety requirement for impurities. Presented **in Figure 1 to 4** are the various impurities that are possible in alcohol raw material. The method for analysis utilizes a modified USP method that is still within allowable adjustments. The method provides identification and quantification of impurities that can be present in alcohol. The same method parameters were extended to the analysis of alcohol-based sanitizer. The sample alcohol sanitizer was dissolved in Dimethylformamide to quantify % alcohol content as shown in **Figure 5**. The precision of the method with respect to peak retention and peak area are presented in **Table 1**. In addition to analysis of alcohols, this method provides a way to analyse % alcohol content in hand sanitizer and to quantify impurities on a single method without the necessity to change method parameters and GC column. This is possible due to the optimal selectivity of ZB-624*PLUS* for volatile compounds like alcohols. In addition, the column has extensive cross-linkage through Engineered Self-Cross Linking (ESC™) and thermal stability of 300/320 °C max temperature to bake out contaminants.

Conclusion

Zebron ZB-624*PLUS* provides optimal selectivity and reproducibility for the analysis of alcohol and alcohol-based sanitizers in a single method.

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