

Analysis of Ethanol in Gel-type Hand Sanitizer

• GC Application



Abstract

A hand sanitizer has an antibacterial effect on bacteria and is used for reducing most of germs on your hand. Recently, a demand for hand sanitizer has been increasing due to the COVID-19 pandemic, so does the analysis of hand sanitizer.

Ethanol, the main ingredient of the hand sanitizer, inactivates the proteins of bacteria and viruses, so, it says in many articles that % content of ethanol should be over 55% to be effective. On the other hand, excessive level of ethanol makes the cell wall of germs hard, so it has low sterilization effect. Therefore, the Ministry of Food and Drug Safety (MFDS) recommends the level of ethanol in hand sanitizer as 55 ~ 70 %.

In this study, ethanol in hand sanitizer was analyzed by ChroZen GC with ChroZen PAL autosampler by referring several standard methods for analysis of ethanol in other applications. There might be different regulations depending on the region.

Instruments and Software

Item	Description	Part No.
Oven	ChroZen GC Mainframe Assembly with UPC Detector Board Unit	6701012502
Inlet	Capillary Inlet Assembly for ChroZen GC	6701012550
Detector	FID (Flame Ionization Detector) Assembly for ChroZen GC	6701012590
CDS	YL-Clarity software for single instrument of YCM GC	5301011020
	Autosampler control of YL-Clarity	5301011040
Column	WAX (30 m x 0.25 mm x 0.25 μ m)	-
Kit	GC Start-up kit	1601011110
Autosampler	ChroZen PAL LSI system for liquid injection	6501011590
	Mounting Kit for ChroZen GC	PAL3-Kit-YI6700

Reagents and Standards

- Ethanol standard
- Ultra-pure water
- Acetonitrile for internal standard (HPLC grade)
- Methanol (HPLC grade)



Fig 1. ChroZen GC

Preparation of Standard Solution

- ① Prepare standards solution in the same concentration of ethanol as the sample.
e.g., if you analyze 70% ethanol in hand sanitizer, take 7 mL of ethanol standard in a 10 mL of volumetric flask and dilute with water to the volume. This is 70 % (v/v) ethanol standard solution.
- ② Take 2g of 70% ethanol standard solution in a 50 mL of volumetric flask and homogenize it adding 10 mL of water. (Make sure to record the weight of standard solution)
- ③ Add 1mL of internal standards (acetonitrile) to “②” and dilute with methanol to the volume.

Preparation of Sample

- ① Take 2g of hand sanitizer in a 50 mL of volumetric flask and homogenize it adding 10 mL of water.
 - ② Add 1mL of internal standards (acetonitrile) to “①” and dilute with methanol to the volume.
- ※ An internal standard is used to improve the precision of quantitative analysis when there is a volumetric loss of sample due to its volatility and mechanical error such as poor skill of syringe injection or a leak by the aged septum.

Method

ChroZen GC System

GC Conditions	FID Conditions
Column: <i>WAX (30 m x 0.25 mm x 0.25 μm)</i>	Temperature: 250°C
Oven temperature program: 35°C (6 min) → 30°C/min → 150°C (1.2 min)	Air: 300mL/min
Carrier gas: 1mL/min (N ₂)	H ₂ : 30mL/min
Inlet: 220°C/ Capillary / Split 1 : 60	Makeup gas: 20mL/min
Injection volume: 1 μL	

Chromatogram

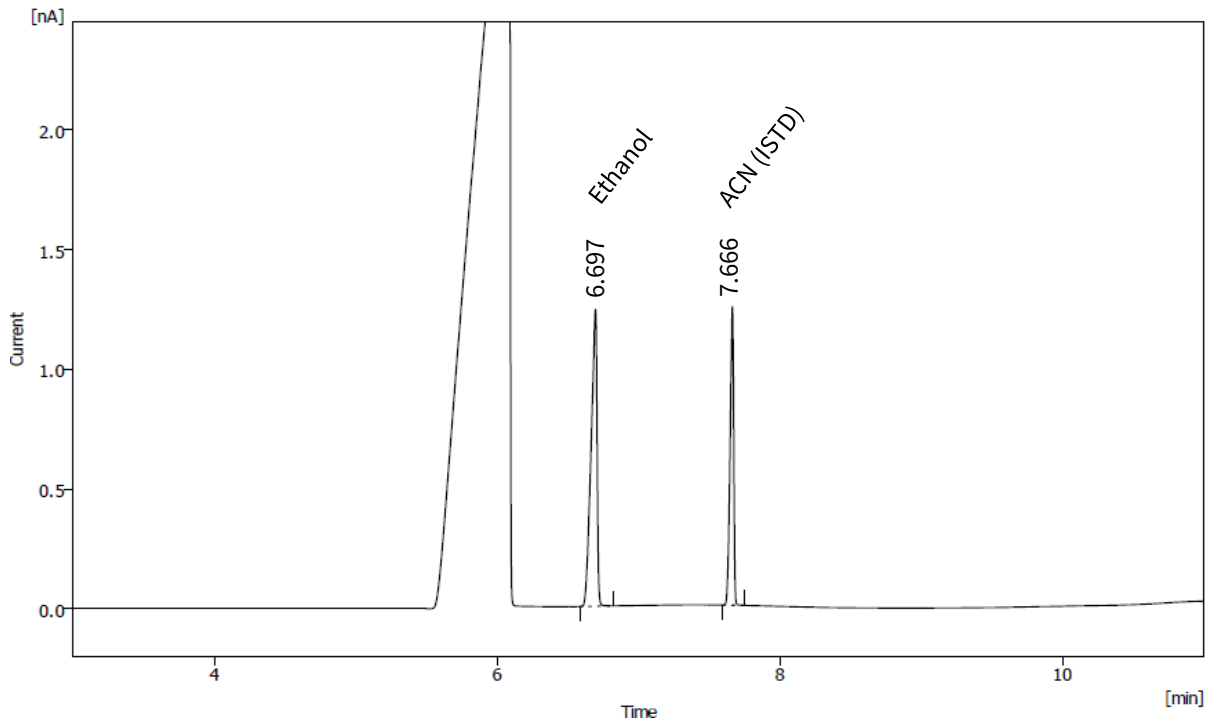


Fig 2. Chromatogram of Standard : 70% Ethanol

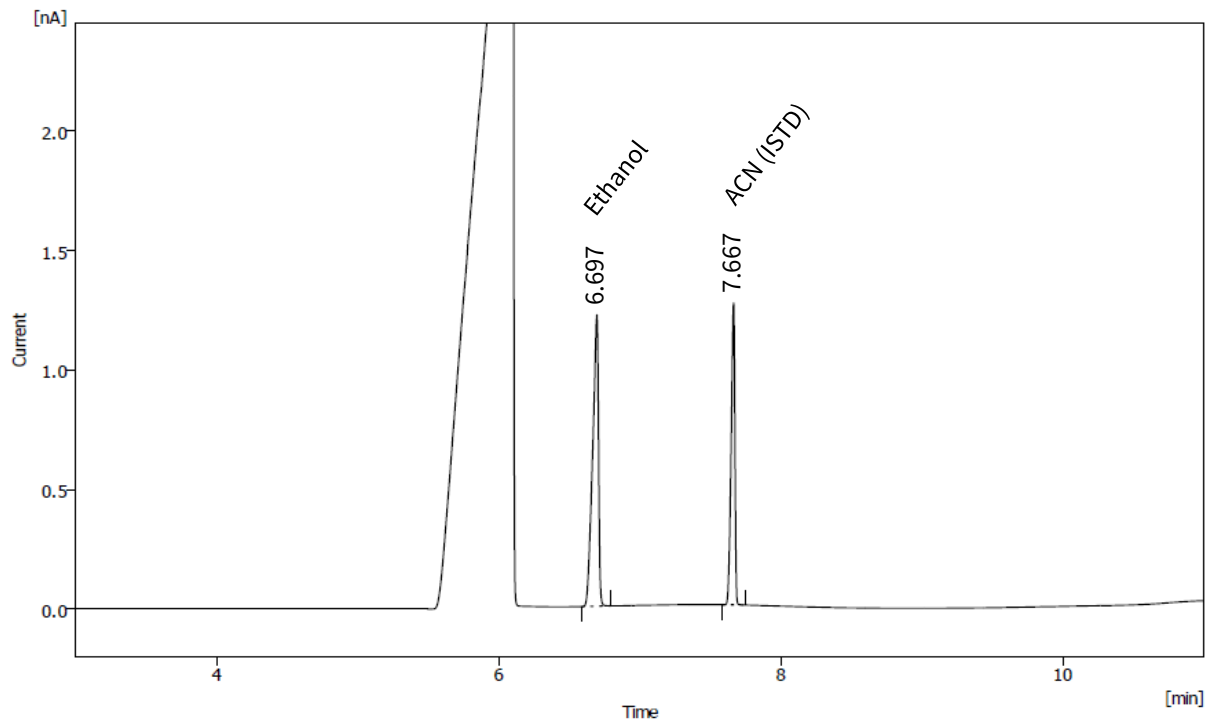


Fig 3. Chromatogram of Sample : hand sanitizer (active ingredient - 62% Ethanol)

Calculation

$$\begin{array}{l} \text{Concentration} \\ \text{of} \\ \text{standard} \\ \text{(70\%)} \end{array} \times \frac{\begin{array}{l} \text{Peak area of ethanol} \\ \text{in sample} \end{array}}{\begin{array}{l} \text{Peak area of ethanol} \\ \text{in standard} \end{array}} \times \frac{\begin{array}{l} \text{Peak area of ISTD} \\ \text{in standard} \end{array}}{\begin{array}{l} \text{Peak area of ISTD} \\ \text{in sample} \end{array}} \times \frac{\begin{array}{l} \text{Amount of standard (g)} \end{array}}{\begin{array}{l} \text{Amount of sample (g)} \end{array}}$$

Result

According to the results, the percentage content of ethanol in hand sanitizer sample is determined to 62% by internal standard method. The results meet the ethanol concentration recommended by the Ministry of Food and Drug Safety (MFDS) and the Centers for Disease Control and Prevention (CDC).

Conclusion

In this study, ethanol in hand sanitizer was analyzed by ChroZen GC with ChroZen PAL autosampler. The ChroZen GC assures the data reliability with accurate and precise control to analyze volatile organic compounds (VOCs) such as ethanol.

Reference

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