

Tri-Step Analysis of Chewing Gum

Application Note

Food & Flavor

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Chewing gum is a complex consumer product containing a wide range of constituents both volatile and non-volatile. Successive thermal treatments followed by GC/MS can unravel the formulation by separating the various ingredients into thermal families for analysis. The fruit flavored gum shown here includes a polymer, sweeteners, flavorings, conditioners and even a plasticizer. A small piece of the gum was placed into a quartz sample tube, and inserted into the Pyroprobe, which was programmed to heat it first to 150°C, then to 300°C and finally to 700°C, starting the GC/MS each time.

By heating the sample to 150°C for a few seconds, the volatile constituents are released without damaging the non-volatile matrix. These include flavorings like limonene, and also the plasticiser triacetin, shown in Figure 1. After the sample has been heated, it is automatically cooled to wait for the next run.

As shown in Figure 2, at 300°C, peaks are seen for less volatile compounds, including glycerine and a paraffin wax, typical gum ingredients.

When the remaining sample is pyrolyzed at 750°C, a small peak is seen for acetic acid, which comes from the polymer polyvinyl acetate. But the major peaks seen are furan carboxaldehyde and hydroxymethyl furan carboxaldehyde, which are degradation products of sugar. The labeled peaks are identified in Table 1.

This three-step approach is applicable to a variety of polymeric systems, including packaging, rubber, and consumer goods .

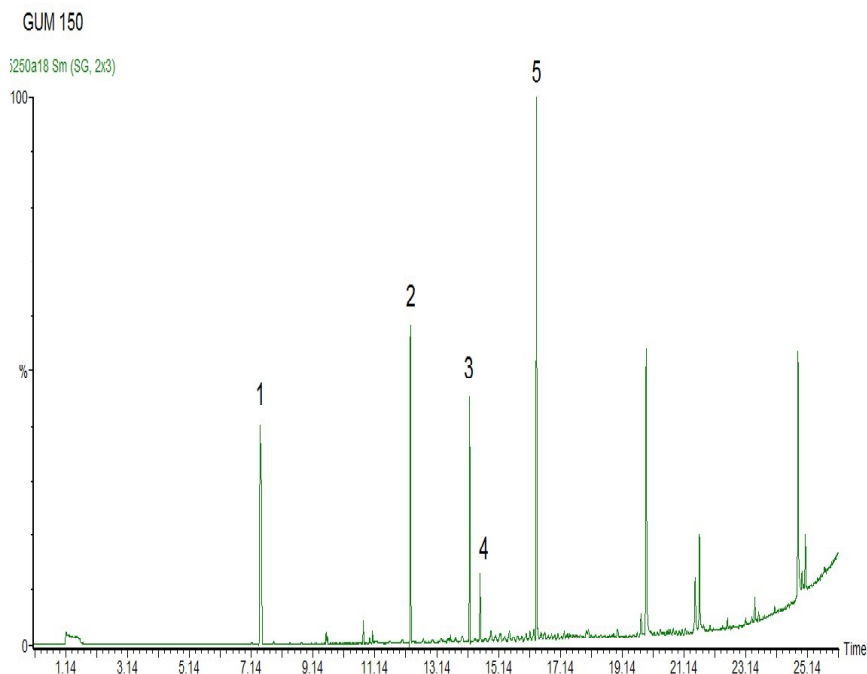


Figure 1. Chewing gum at 150°C.

Instrument Conditions

Pyroprobe

Valve Oven: 225°C
Interface: 150°, 300°C
Pyrolysis: 700°C
Time: 15 seconds

GC/MS

Column: 5% phenyl (30m x 0.25mm x .25µm)
Carrier: Helium, 50:1 split
Injector: 300°C
Oven: 40°C for 2 minutes
10°C/min to 300°C

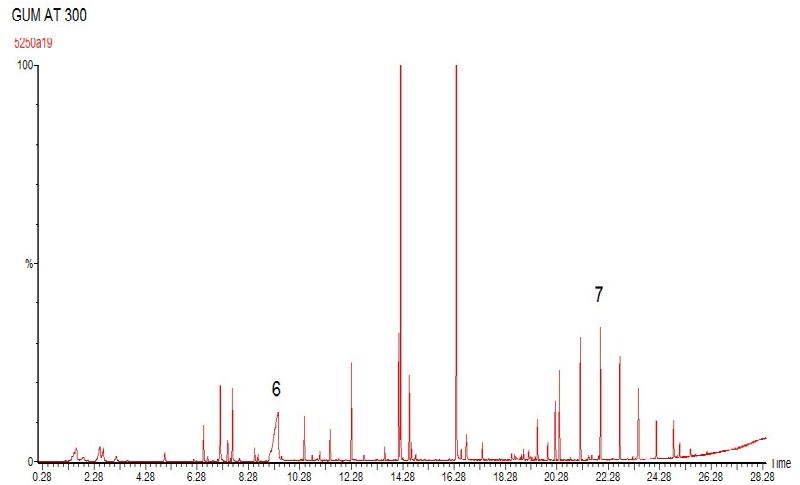


Figure 2. Chewing gum at 300°C.

Table 1

Peak # COMPOUND

1 L-LIMONENE

2 METHYL SALICYLATE

3 EUGENOL

4 CINNAMALDEHYDE

5 TRIACETIN

6 GLYCERIN

7 WAX

8 ACETIC ACID

9 2-FURANCARBOXALDEHYDE

10 2-FURANCARBOXALDEHYDE, 5-(HYDROXYMETHYL)-

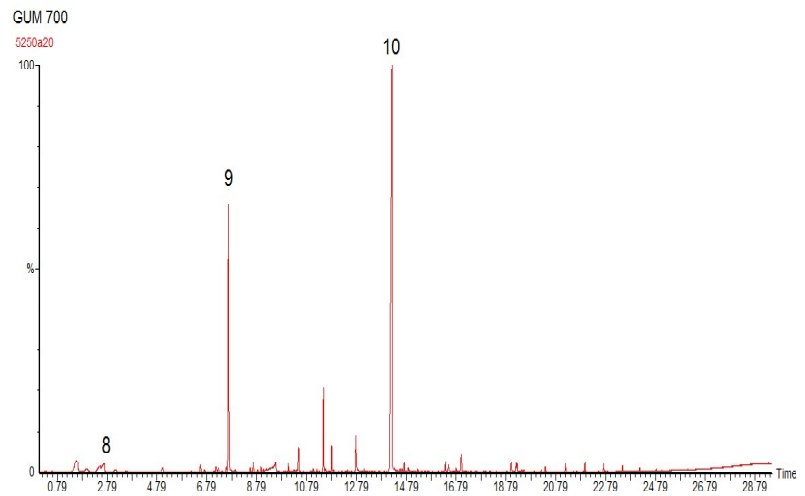


Figure 3. Chewing gum at 700°C..

FOR MORE INFORMATION CONCERNING THIS APPLICATION,
WE RECOMMEND THE FOLLOWING READING:

T. P. Wampler, Introduction to Pyrolysis-Capillary Gas Chromatography, J. Chromatography A, 842: 207-220 (1999).