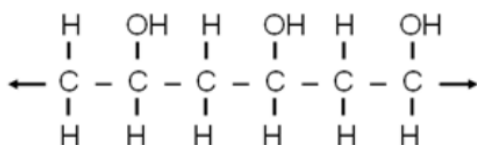


Pyrolysis-GC/MS and FGA of Poly Vinyl Alcohol

When poly vinyl alcohol is pyrolyzed, it produces a series of unsaturated aldehydes and also aromatic aldehydes, as shown in Figure 1. Since poly vinyl alcohol has the structure shown below:



Poly Vinyl Alcohol structure

a primary degradation mechanism would appear to be dehydration, causing double bonds, and eventual aromatization. This is similar to the degradation mechanism seen in poly vinyl chloride (PVC) in which HCl is first stripped from the polymer, which creates multiple double bonds, eventually producing aromatics.

If dehydration is actually occurring, examination of the small molecules by fixed gas analysis (FGA) should show a peak for water. Using a Pyroprobe 5200 with a trap permits passing the gaseous products to a sample loop which is interfaced to a Model 5500 FGA instrument, equipped with a packed column and thermal conductivity detector.

Figure 2 is the FGA analysis for a sample of poly vinyl alcohol heated to 750°C, showing that water is in fact a major product. The analysis also reveals the presence of carbon monoxide, as well as some methane and carbon dioxide.

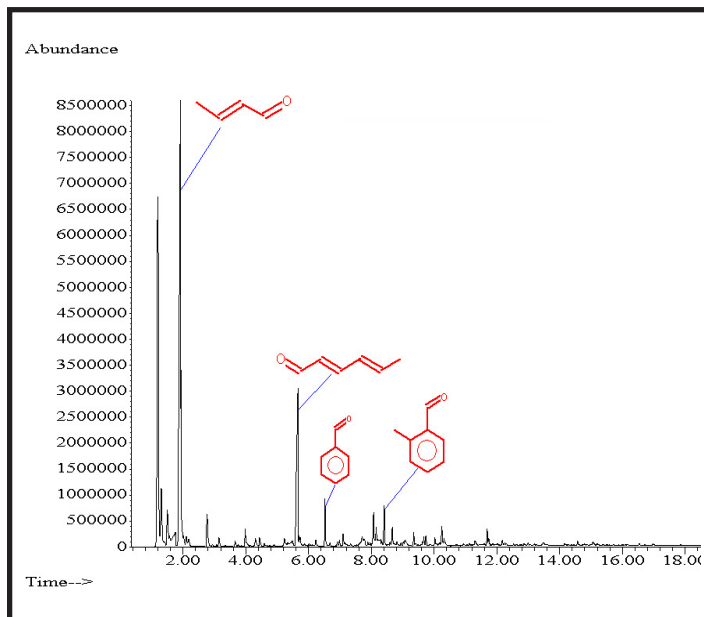


Figure 1. Pyrolysis-GC/MS of poly vinyl alcohol at 750°C.

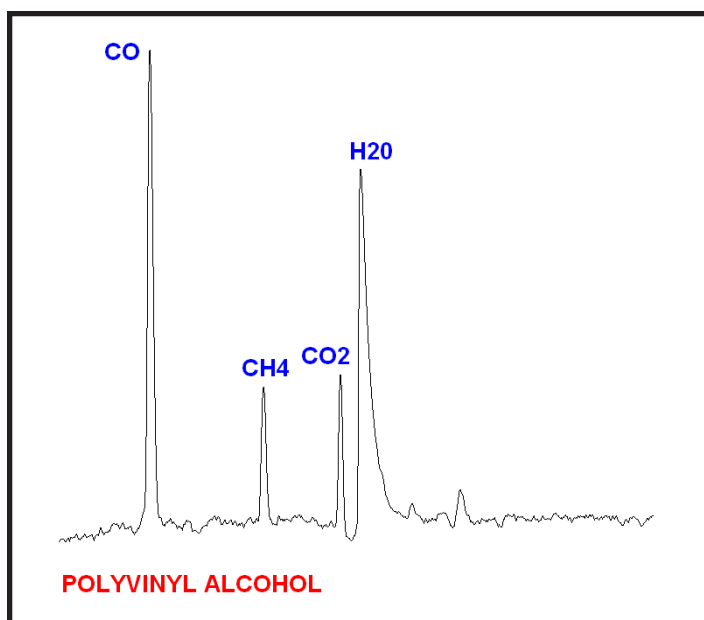


Figure 2. Fixed gas analysis from pyrolysis of poly vinyl alcohol.

Experimental Parameters

All samples were pyrolyzed using a CDS Pyroprobe 5200 equipped with a Tenax trap.

Pyroprobe

Pyrolysis: 750°C for 15 seconds
Interface: 300°C for 4 minutes
Carrier flow: 30 ml/min
Trap initial: 40°C
Trap desorption: 300°C for 4 minutes

GC/MS

Column: 30 m x 0.25 mm 5% phenyl MS
Carrier: Helium
Split: 50:1
Oven program:
40°C for 2 minutes
10°C/minute to 325°C

Fixed Gas Analysis

Column: Carboxen 1000 1/8" X 9"
Detector: TCD
Oven: 30°C for 2 minutes, then
30°C/min to 300°C

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

T. Wampler, Introduction to pyrolysis-capillary gas chromatography, J. Chromatography A, 842 (1999) 207-220.

Additional literature on this and related applications may be obtained by contacting your local CDS Analytical representative, or directly from CDS at the address below.

CDS Analytical, LLC has been a leader in the design and manufacture of laboratory instruments for sample preparation and analysis since 1969. We are dedicated to providing the best possible instruments for both research and routine analysis. Well known in the field of pyrolysis, CDS manufactures the Pyroprobe® 5000, 5150, 5200 and 5250 autosampler for the introduction and analysis of solid materials by GC, MS and FT-IR. CDS offers a complete line of dynamic headspace instruments for the analysis of volatile organic compounds in environmental, pharmaceutical and food applications, including the model 8400 four-position autosampler. CDS also manufactures the Dynatherm line of thermal desorption instruments including the 9000 series for air monitoring and the 9300 TDA. Our customers, their requirements and applications are important to us. To help meet your needs, we offer a wide range of analytical information and the services of our applications laboratory. If you would like additional information, please contact us at the address below, call us at 1 800 541 6593, or log onto www.cdsanalytical.com.