CDS solutions

*APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY*

# Pyrolysis of Natural and Synthetic Adhesives

Commercial adhesives are made from a large number of different materials both natural and synthetic. Materials such as animal hides, fish offal, and other natural materials like casein and starches have all been utilized in the making of glues. There is a myriad of synthetic adhesives which are commercially available on the market today.Their compositions include styrene-butadiene rubber based, epoxy resins, polyvinyl acetate emulsions, and cyanoacrylates like Krazy Glue®. Most adhesives, whether natural or synthetic, contain solvents which first might be eliminated using a programmed temperature ramp on the same sample. Once this is done, higher pyrolysis temperatures can be used to fragment either the natural products or polymer products of either adhesive group.

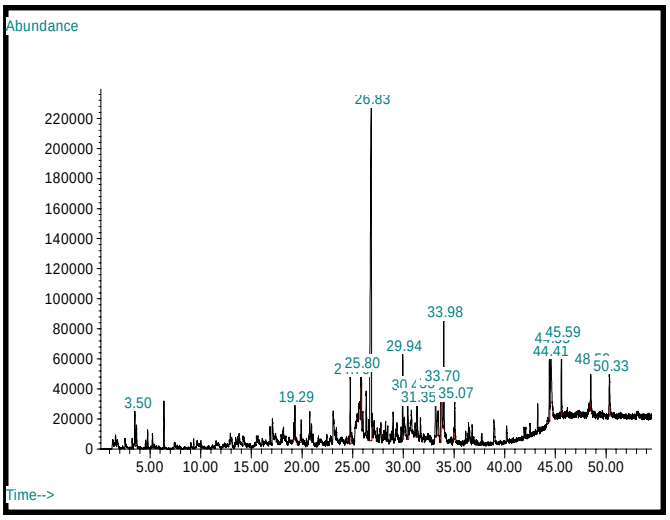


Figure 1

A natural hideglue (solid) and synthetic adhesive for carpeting were pyrolyzed at 700 °C for 10 seconds and chromatographed using a MSD detector. Examination of the total ion chromatogram of the hideglue (Figure1) shows typical nitrogenous compounds like pyrrole at 3.90 min and substituted pyrimidines at 19.29 min. The chromatogram of the carpet adhesive (Figure 2) shows typical methacrylates as the methyl ester at 2.81 min and the octyl ester at 17.22 min.

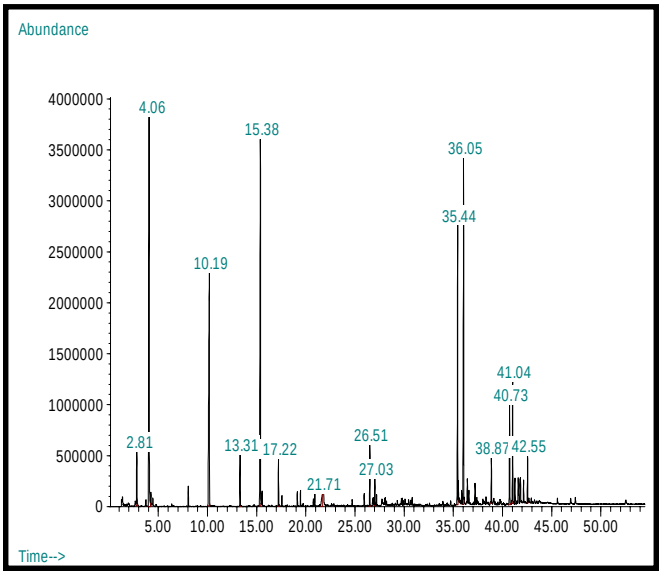


Figure 2

Similarly pyrolysis using GC/MS for analysis could be used to determine component make-up of other adhesives mentioned above like Krazy Glue®.

## Equipment

All samples were pyrolyzed using a CDS Model 2500 Pyrolysis Autosampler interfaced to a Hewlett-Packard 6890 gas chromatograph with a mass selective detector.

## Pyrolysis

| | |
|---|---|
| Interface oven: | 300 °C |
| Ramp: | 10 °C/ms |
| Temperature: | 700 °C |
| Time: | 10 s |
| Clean: | 1000 °C for 10 s |

## Chromatography

| | |
|---|---|
| Carrier: | He |
| Column: | HP-5 |
| | 30 m x 0.25 mm |
| Split: | 75:1 |
| Initial temperature: | 40 °C for 2 min |
| Ramp: | 6 °C/min |
| Final temperature: | 295 °C for 10 min |

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

Bakowski, N. et al., Comparison and Identification of Adhesives used in Improvised Explosive Devices by Pyrolysis-Capillary Column GC/MS, J. Anal. App. Pyrol. 8, 483-492 (1985)

J. Challinor, Examination of Forensic Evidence, in Applied Pyrolysis Handbook, T. P. Wampler (Editor), Dekker, US, 1995, Chapter 8, p.217.

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, Inc.

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