CDS solutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Pyrolysis-GC/MS in the Analysis of Fiber Blends

Fiber blends are like other polymer blends or mixtures when analyzed by Py-GC/MS in that the individual polymers pyrolyze independently, and the resulting pyrogram contains pyrolysates from each of the constituents. Figure 1 illustrates this process for a blend of Polyethylene terephthalate (PET) and Polyacrylonitrile (PAN). The top pyrogram in Figure 1 is PET only, showing the typical pyrolysis products, including benzoic acid, listed in Table 1. The bottom pyrogram is for PAN only, and has large peaks for acrylonitrile monomer and dimer. The blended fiber is in the middle, and has the characteristic peaks of both the individual fibers. Since the pyrolysis products of each polymer rarely interact with each other, comparing the amount of a product generated from one fiber to a compound from the other can be used to determine the relative amounts of each of the polymers present.

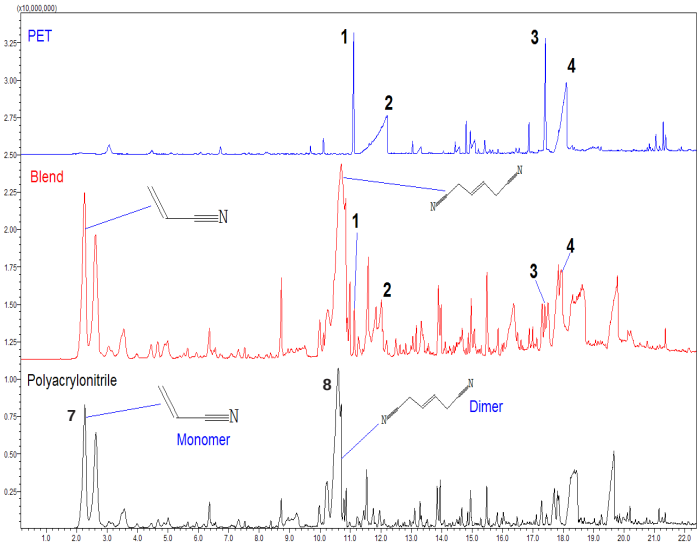

Figure 1. PAN/PET fiber blends.

Figure 2 shows the pyrogram of a cotton/polyester blend fabric listed as 30% cotton. The fabric was actually made using two different fibers. One of the fibers was pure PET, shown in the upper pyrogram. The other fiber contained the cotton, but was a blend itself that also contained PET. Consequently there are peaks from the cellulose in the cotton (specifically furfural and levoglucosan) as well as the benzoic and terephthalic acid products from the PET.

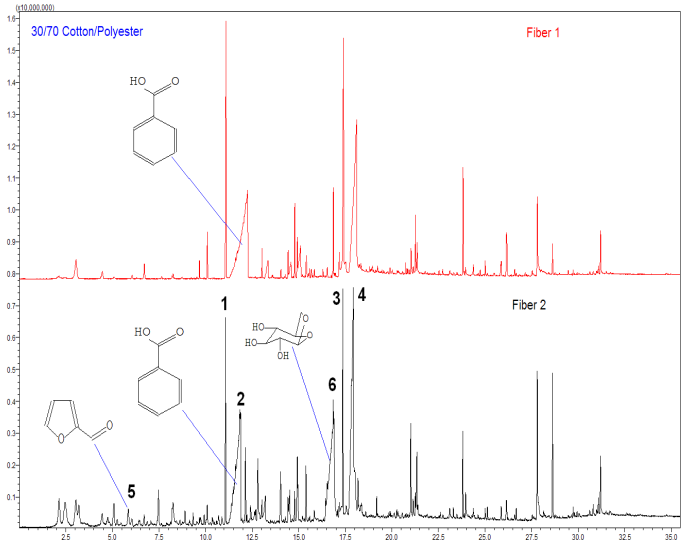

Figure 2. Cotton/polyester blend fibers.

Table 1

Peak #	Compound
1	Vinyl benzoate
2	Benzoic acid
3	Divinyl terephthalate
4	Terephthalic acid monovinyl ester
5	Furfural
6	Levoglucosan
7	Acrylonitrile
8	Hexene dinitrile

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

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

T. P. Wampler, Introduction to pyrolysis-capillary gas chromatography, J. Chrom. 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.

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