CDS solutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Pyrolysis-GC/MS of Powder Coatings

Powder coatings are an alternative to solvent based paints, and are applied as a dry powder that is then heated to form the coating. They may be thermoplastic, in which the film is melted and can be reheated, or thermoset, in which the coating is crosslinked during the curing process. Typical powdercoats are made from epoxies, polyesters or a mixture of the two, but they can also contain many other polymer types.

Like other synthetic polymers, powder coatings may be analyzed easily using pyrolysis-GC/MS. A small piece of the coating (about 100 µg) is simply placed into the quartz tube of a Pyroprobe and heated rapidly at the beginning of the GC analysis. Figure 1 shows three powder coatings pyrolyzed at 750°C. An epoxy powder coating at top, which produces phenolics and Bisphenol A when pyrolyzed, and a polyester of terephthalic acid on the bottom, which makes, among other things, benzoic acid. In the center is a hybrid, which has both epoxy and polyester components, so it produces both the Bisphenol A seen in the epoxy and the benzoic acid seen in the polyester.

Figure 2 shows the pyrogram of a black coating from a metal hook. This coating not only has the typical pyrolysis products of the epoxy polyester hybrid, but many others as well. There is a large peak for methyl methacrylate, a peak for styrene and even a diisocyanate, indicating polyurethane.

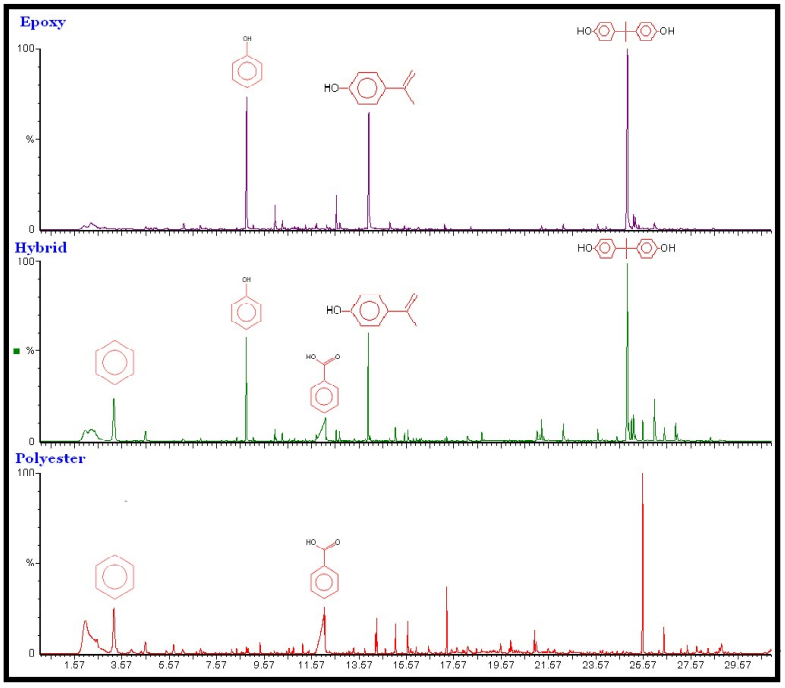

Figure 1. Typical powder coatings. Epoxy (top), Polyester (bottom) and Hybrid (center).

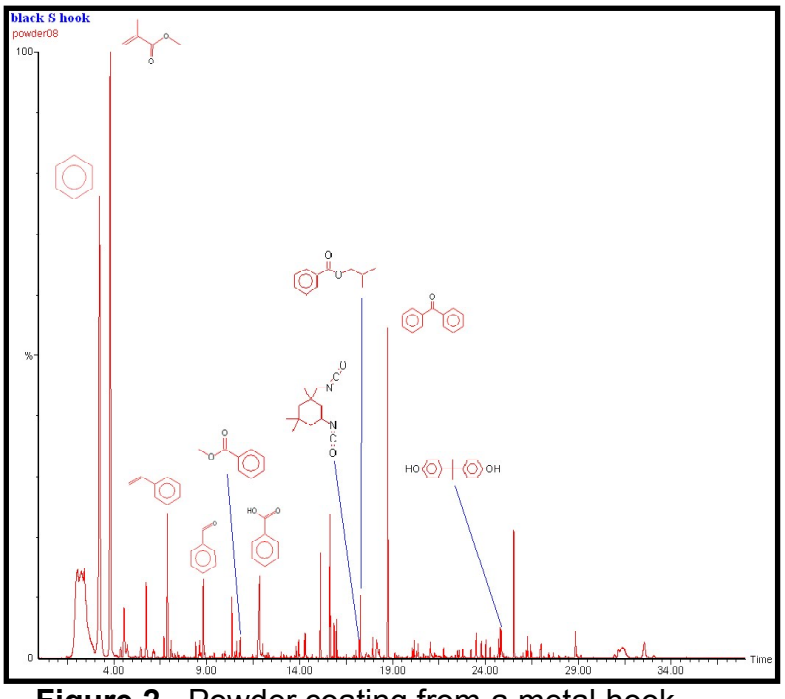

Figure 2. Powder coating from a metal hook.

Equipment

Pyrolysis

All samples were pyrolyzed using a CDS Analytical Model 5200 Pyroprobe interfaced to a GC/MS.

Pyrolysis Parameters

Pyrolysis temperature:	750° for 15 seconds
Valve oven:	325°C
Transfer line:	325°C
Trap desorption:	300°C for 4 minutes

GC Parameters

Column:	30 m x 0.25 mm 35% Phenyl MS
Oven:	40°C for 2 min, then 10°/min to 300°C
Carrier:	Helium, 50:1 split
Mass range:	35 to 550 amu

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

T. P. Wampler, Introduction to Pyrolysis-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.

CDS Analytical, Inc. 465 Limestone Road, P.O. Box 277, Oxford, PA USA 19363-0277 PH: 610 932 3636 FX: 610 932 4158