CDS olutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Pyrolysis-GC/MS of Automobile Paints

Pyrolysis-GC has been used in the study of automobile paints in both industrial and forensic laboratories for decades. When a paint sample is pyrolyzed, the polymeric material involved is fragmented to smaller molecules, permitting analysis by gas chromatography. Consequently, Py-GC can provide information not only about the kinds and relative amounts of the various monomers used, but about other constituents as well.

Through the 1980's, automotive paint formulations included primarily copolymers of methyl methacrylate (MMA), butyl acrylate (BA), styrene and butyl methacrlylate (BMA), with additives to provide flexibility, stabilization, etc. Later, formulations were changed to incorporate smaller polymer chains which were crosslinked in place, for example, using urethane or epoxy bonds. In addition, plasticity is often provided by including longer side chain monomers into the polymer itself instead of adding a separate plasticizing agent. Evidence of these newer constituents appears in the pyrograms, marking them as clearly different from pyrograms obtained from paints of earlier formulations.

The two paint pyrograms shown in Figure 1 illustrate many of these changes.

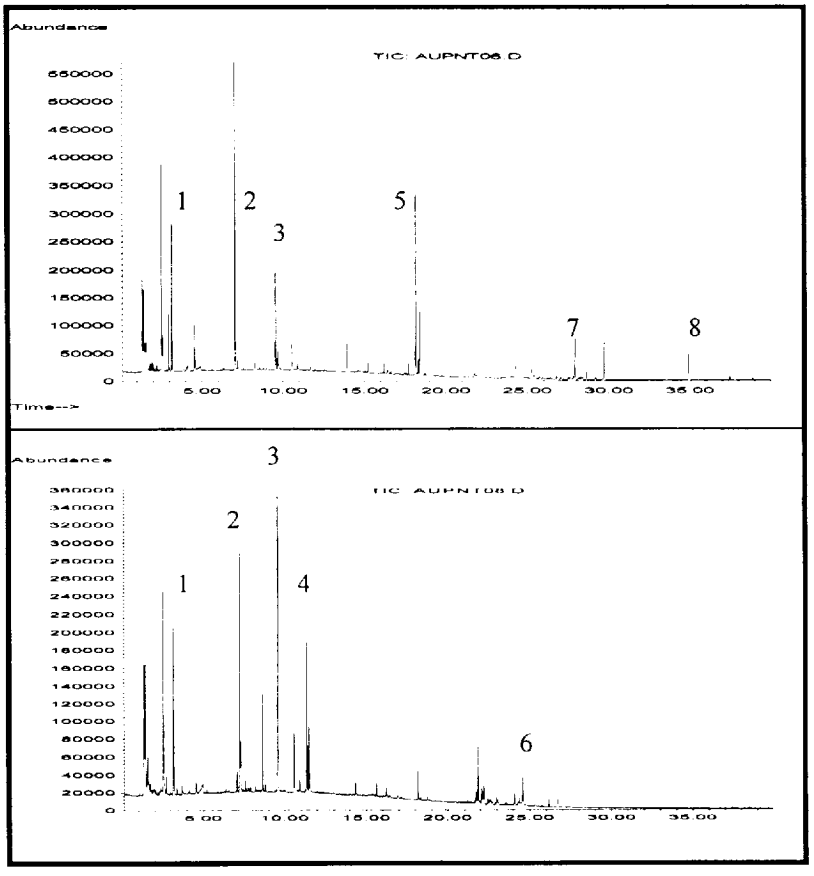

Figure 1. Comparison of two post-1990 automotive paints.

Peak Identification:

1. Methyl methacrylate
2. Styrene
3. Butyl methacrylate
4. Hydroxypropyl methacrylate
5. Octyl methacrylate
6. IDI (A diisocyanate)
7. Decyl methacrylate
8. Bisphenol A

Like many earlier formulations, each paint includes MMA, BMA and styrene. The upper pyrogram also reveals both octyl and decyl methacrylate, long chain methacrylates added to incorporate flexibility into the polymer, as well as Bisphenol A from the epoxy crosslinking. The lower pyrogram shows hydroxypropyl methacrylate and a diisocyanate used in the urethane crosslinking of this paint.

Equipment

Pyrolysis

CDS Model 2500 Pyrolysis Autosampler
Sample in quartz tube
750°C for 10 seconds
Valve oven 300°C

Chromatography

HP 6890/MSD
Carrier: Helium, split 75:1
Column: HP-5, 30 m
Program: 40°C for 2 minutes, then 8°/minute to 290°

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

Gas Chromatographic-mass spectrometric determination of phenols and heterocyclic nitrogen compounds in the thermal degradation products of epoxy powder paint, K. Peltonen, JAAP 10 (1986) 51.

Examination of forensic evidence, J. Challinor, in Applied Pyrolysis Handbook, T. Wampler, Editor, Marcel Dekker, New York.

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

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