# CDSolutions

*APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY*

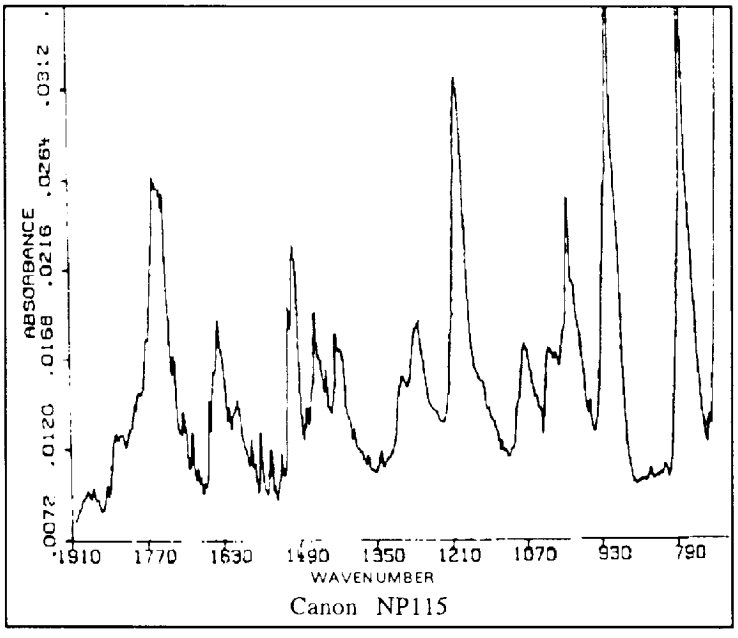
## The Analysis of Photocopier Toners by Pyrolysis/FT-IR

The ability to analyze photocopier toners is important in forensics, quality control and competitive analysis within the toner industry. Toners in general consist of a colorant such as carbon black or iron oxide imbedded in a matrix of organic material. The nature of the organic matrix, the colorant used, and other additives present are all important in toner identification. Since the colorants tend to interfere with standard analyses such as IR spectrometry, the use of pyrolysis to vaporize the organic components, coupled to gas chromatography with mass spectroscopic detection, has become common. This technique is time consuming because of the length of the GC temperature program necessary for good separation of polymeric materials. Pyrolysis directly coupled to FT-IR is a very rapid method that results in equally reliable copier identification.

Figures 1 to 3 demonstrate the fingerprint region of three different copier toners, all polystyrene based. The three toners are easy to distinguish based on the different ratios of the absorbance at wavenumbers that match the pattern formed by styrene (major peaks at wavenumbers 774 and 910) and those of butylmethacrylate (major peak at wavenumber 1165). There are numerous more subtle differences between these three toners, and a library match search could characterize them in detail.

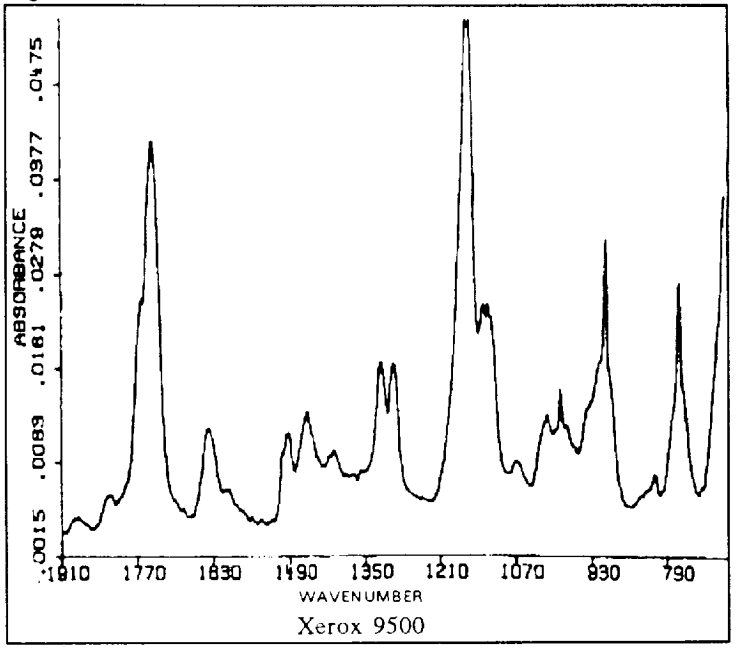
There are dozens of copier toners currently available, but the chemical differences between them make them straightforward to identify by pyrolysis/FT-IR. Using methods previously developed to remove dry toner from paper, paper copies can also be matched to toner using the same technique.

**Figure 1**



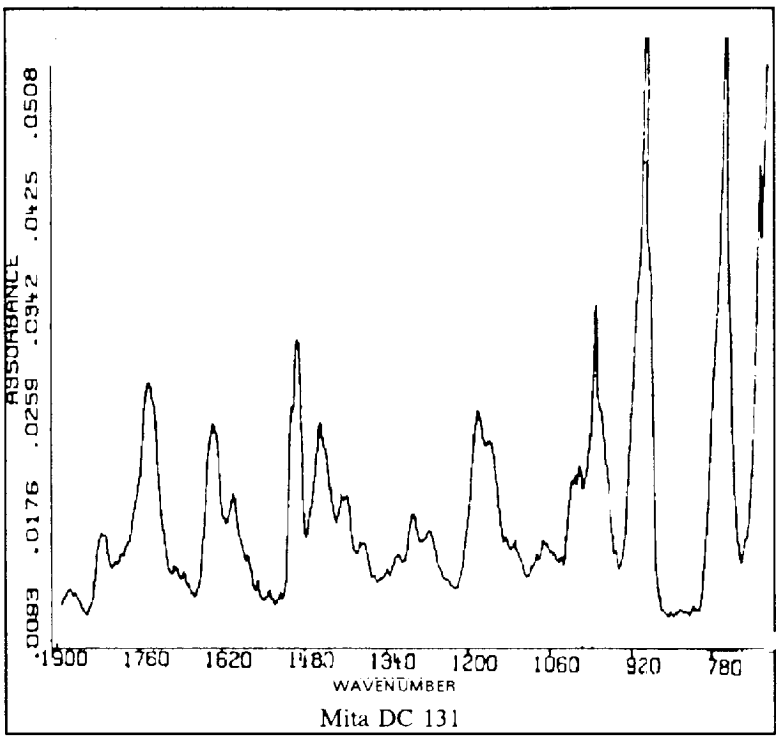
Canon NP115

**Figure 2**



Xerox 9500

Figure 3



Mita DC 131

## INSTRUMENTATION

A CDS Analytical Model 1000 Pyroprobe with a platinum coil was used for pyrolysis/FT-IR. A CDS Analytical Brill Cell, with standard 1/4" Zn/Se windows, was the interface to a Nicolet 710 FT-IR spectrometer equipped with a DTGS detector with a scan speed of 1 scan/sec . The interface temperature was held at 120 C, with a nitrogen purge gas flow of 40 ml/min. Unless noted otherwise, all pyrolysis was performed at 850 C for 25 seconds in a quartz boat inserted in the pyroprobe coil.

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

J. W. Washall and T.P. Wampler. *Direct-Pyrolysis Fourier Transform-Infrared Spectroscopy for Polymer Analysis.* Spectroscopy 6 (4) (1989) 38-43.

P.J. Gale, et al. *Characterization of Polymers by Pyrolysis Mass Spectrometry.* RCA Rev., 47 (1986) 380-397.

T.O. Munson. *The Classification of Photocopies by Pyrolysis-Gas Chromatography-Mass Spectrometry.*

Available from CDS Analytical:

Direct Pyrolysis/FT-IR: An Alternative Sampling Technique.

*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.*

*Produced by M.J. Matheson, 493.*

## ABOUT CDS

CDS Analytical, Inc. is a leader in the design and manufacture of laboratory instruments for sample preparation and analysis. With over 20 years experience in the field, CDS is dedicated to providing the best possible instruments for both research and routine analysis. Well known in the field of analytical pyrolysis, CDS manufactures the Pyroprobe 1000 and 2000 for the introduction and analysis of solid materials by GC, MS and FT-IR. CDS offers a complete line of purge and trap instruments for the analysis of volatile organic compounds in the environmental, food and pharmaceutical areas, as well as custom systems for complex, multicomponent materials investigation. Our customers, their requirements and applications are important to us. To help meet their 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, or call us at 1 800 541 6593.

4/93

CDS Analytical, Inc. 7000 Limestone Rd., P.O. Box 277, Oxford, PA USA 19363-0277 Ph: 215 932 3636