CDSolutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Analysis of Hair Samples by Pyrolysis Gas Chromatography

Pyrolysis gas chromatography is a technique for applying GC to the analysis of solid samples. The sample materials are first heated to the point of bond dissociation, producing volatile fragments of the original solid, and it is these fragments which are then analyzed by the gas chromatograph. This technique has been applied by forensic laboratories to the analysis of trace evidence samples, such as paint flakes from automobile accidents, as well as by laboratories concerned with the manufacture and quality control of synthetic polymers. It is also a useful tool in the analysis of threads and fibers, both synthetic (the Nylons, for example), and natural such as cotton (cellulose), wool and silk (proteins), and hair samples.

Figure 1 is a pyrogram produced by pyrolyzing a 15mm length of human hair. The sample was placed into a quartz tube, which was inserted into the platinum coil of a Pyroprobe, and heated to 700°C for 10 seconds. The resulting pyrolysates were cryogenically focused onto the head of the capillary column prior to starting the GC program, which provided the sensitivity of splitless capillary analysis without sacrificing resolution.

Figure 2 shows the pyrogram which is produced when the same technique is applied to a

Figure 1

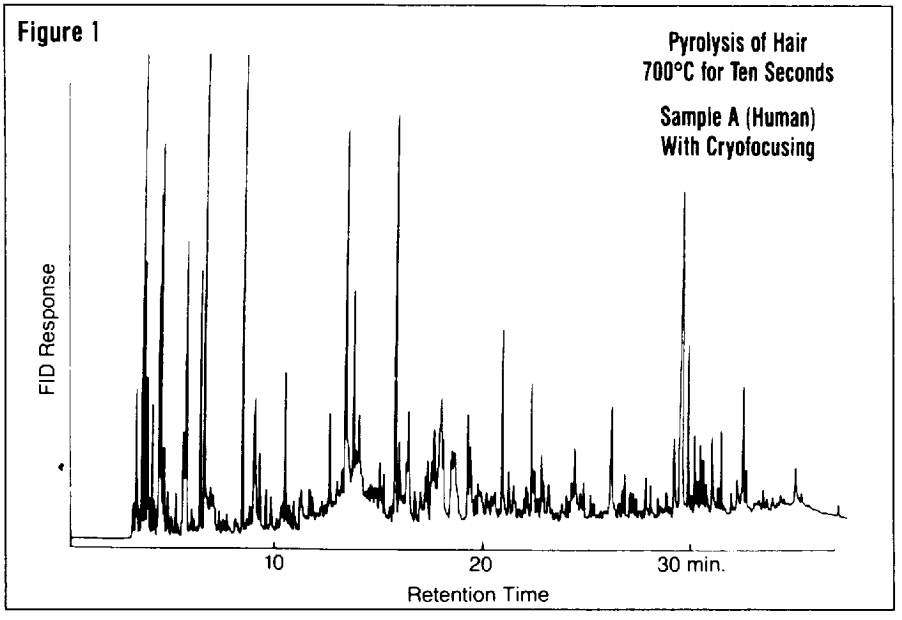
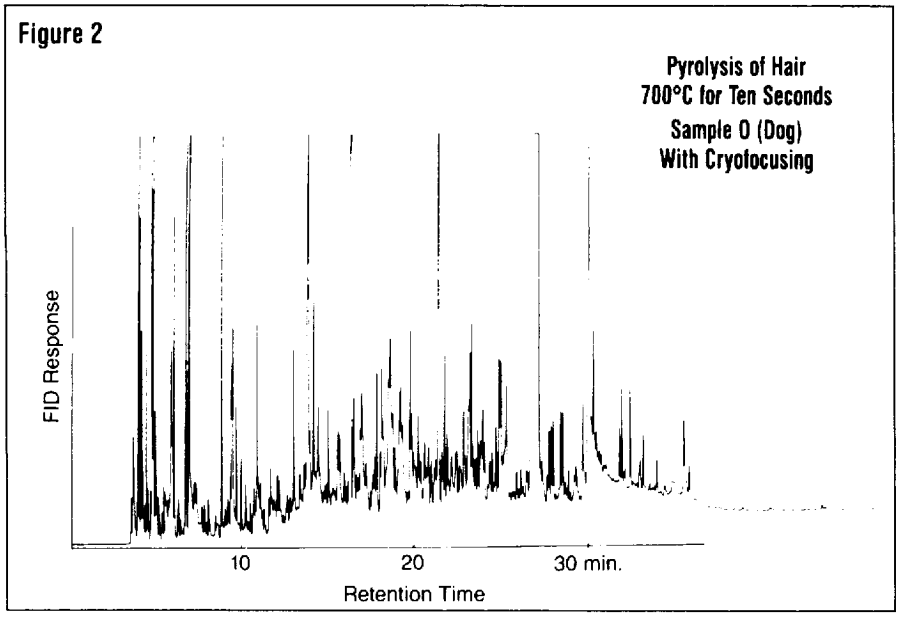


Figure 2



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sample of canine hair. The first 15 minutes of the two chromatograms are very similar, having the same major peaks in roughly the same relative abundance. There are some noticeable differences between 20 and 30 minutes, where two peaks which are only minor constituents in the human sample become major peaks in the pyrogram of canine hair (at retention times of 22 and 27 minutes). There are also many minor differences which may be due more to distinctions in secondary characteristics (pigmentation, oils, etc.) than to differences in the actual protein structure of the hair itself.

Equipment

PYROLYSIS

Pyroprobe 124 equipped with cryogenic refocuser at the injection port of the gas chromatograph

Pyrolysis temperature: 700°C for 10 seconds

Interface temperature: 275°C

Cryogenic temperature: -100°C for 10 minutes

Desorption temperature: 275°C for 10 minutes

GAS CHROMATOGRAPHY

Varian 3700 equipped with a flame ionization detector

Initial temperature: 50°C for 2 minutes

Ramp rate: 6°C/min. to 290°C

Column: 50m x 0.25mm SE-54 fused silica capillary

Carrier: Helium at 20psi

For more information on this and related applications, we recommend the following readings:

T. Munson, and J. Vick, "Comparison of Human Hair by Pyrolysis Capillary Gas Chromatography and Gas Chromatography/Mass Spectrometry," J.A.A.P., 8, (1985), 493-501.

T. Wampler, and E. Levy, "Cryogenic Focusing of Pyrolysis Products for Direct (Splitless) Capillary Gas Chromatography," J.A.A.P., 8, (1985), 65-72.

Additional literature may be obtained from your Chemical Data Systems representative, or by writing to the CDS Applications Lab.

ABOUT CDS

CDS Analytical, Inc. is a leader in the design and manufacture of laboratory instruments for sample preparation and analysis. With 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.

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