

Eight Step Analysis of Flyash

Flyash is a mostly inorganic byproduct of coal combustion, usually recovered from electrical generating plants. Because of its physical and chemical properties, it is used to replace up to 35% of the cement used in making concrete. During processing, the flyash is heated extensively, and a wide range of organic compounds are released.

To analyze both the thermal behavior and resulting compounds produced, a sample of flyash was heated sequentially to 100, 200, 300, 400, 500, 600, 700 and 1000°C using a Pyroprobe 5200. Even at relatively low temperatures, gases were given off, mostly carbon dioxide and sulfur dioxide. At higher temperatures, however, flyash releases both aromatic and aliphatic compounds, including polyaromatic hydrocarbons, phenolics and normal hydrocarbons. As seen in Figure 1, the greatest amount of organics were produced at about 500°C, but some are still seen even in the run at 1000°C.

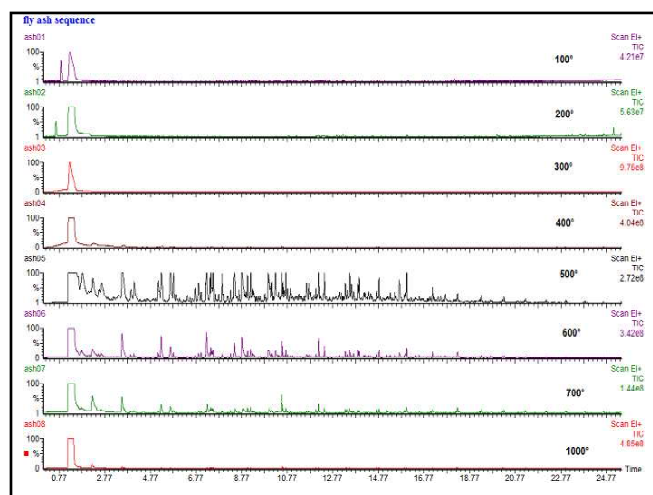


Figure 1. Sequential analysis of fly ash

The 500°C analysis is expanded in Figure 2 to show the kinds of compounds detected at this temperature. At higher temperatures, the pyrogram becomes dominated by aromatic and polycyclic compounds, but the total amount of organics is less than that seen at the lower temperatures.

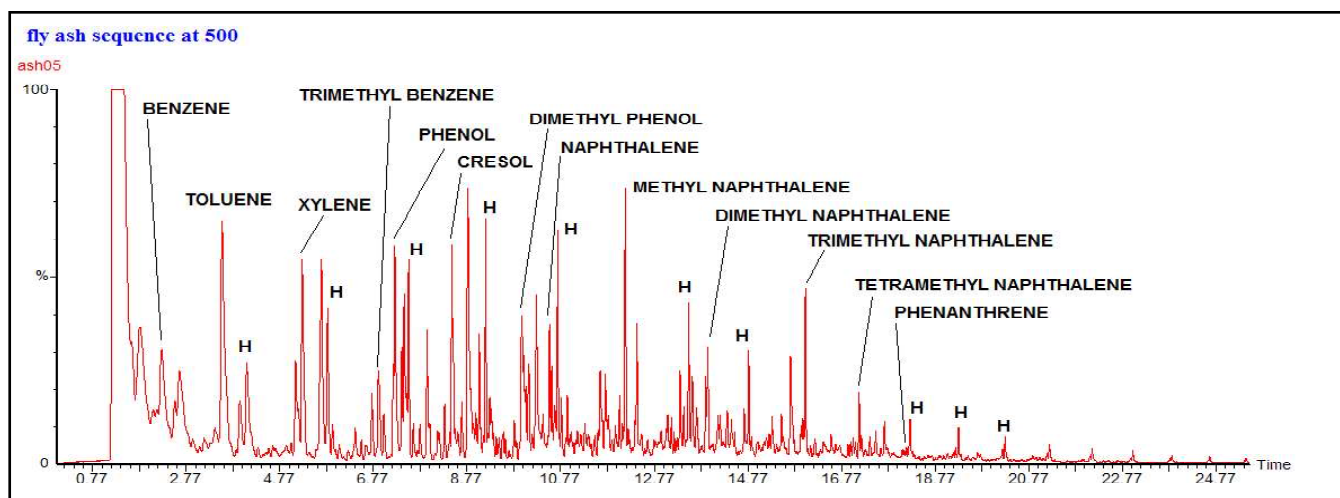


Figure 2. Run #5, 500°C for 15 seconds. Normal hydrocarbons are marked "H".

Equipment

These samples were analyzed using a CDS Model 5200 Pyroprobe, interfaced to a Clarus 500 gas chromatograph/mass spectrometer.

Model 5200 Conditions

Valve Oven: 300°C
Transfer Line: 325°C
Temperature: 100°-1000°C
Time: 15 seconds
Interface: 100°C for the 100° run
200°C for the 200° run
300°C for the 300° run
325°C for all higher runs
Sample size: 20 mg

GC Conditions

Carrier: Helium
Split: 50:1
Column: Rxi-5ms (30m X 0.25mm)
Detector: Clarus 500 MS

GC Program:

Initial: 40°C for 2 minutes
Ramp: 10°C/min.
Final: 300°C

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

Wampler, T., *Introduction to pyrolysis-capillary gas chromatography*, J. Chromatography 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. has been a leader in the design and manufacture of laboratory instruments for sample preparation and analysis since 1969. We are dedicated to providing the best possible instruments for both research and routine analysis. Well known in the field of pyrolysis, CDS manufactures the Pyroprobe® 5000, 5150, 5200 and 5250 autosampler for the introduction and analysis of solid materials by GC, MS and FT-IR. CDS offers a complete line of dynamic headspace instruments for the analysis of volatile organic compounds in environmental, pharmaceutical and food applications, including the model 8400 four-position autosampler for complex, multicomponent materials investigation. Our customers, their requirements and applications are important to us. To help meet your 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, call us at 1 800 541 6593, or log onto cdsanalytical.com.