Eight Step Analysis of Flyash

Application Note
Environment

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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. 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.

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.

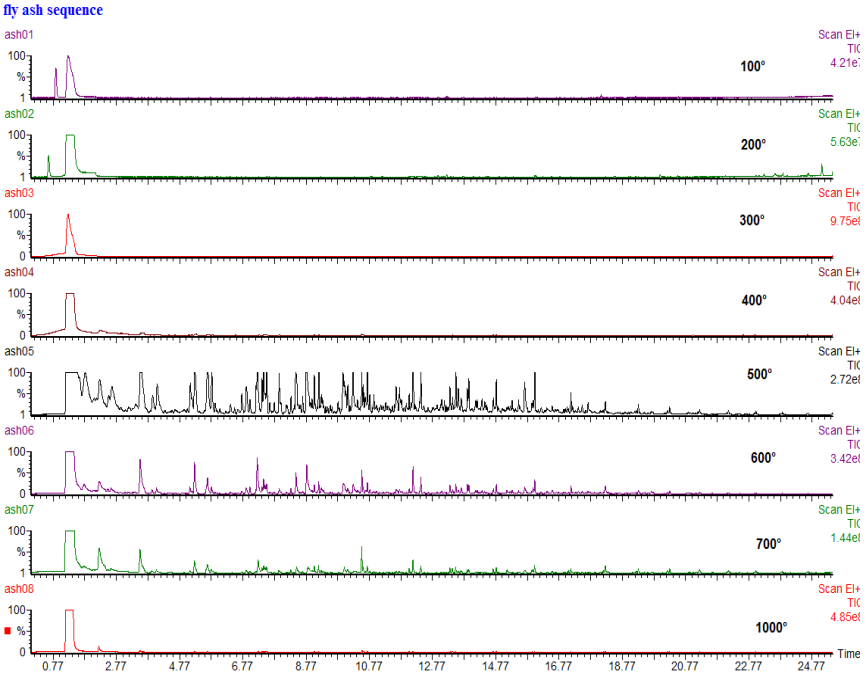

Figure 1. Sequential analysis of fly ash.

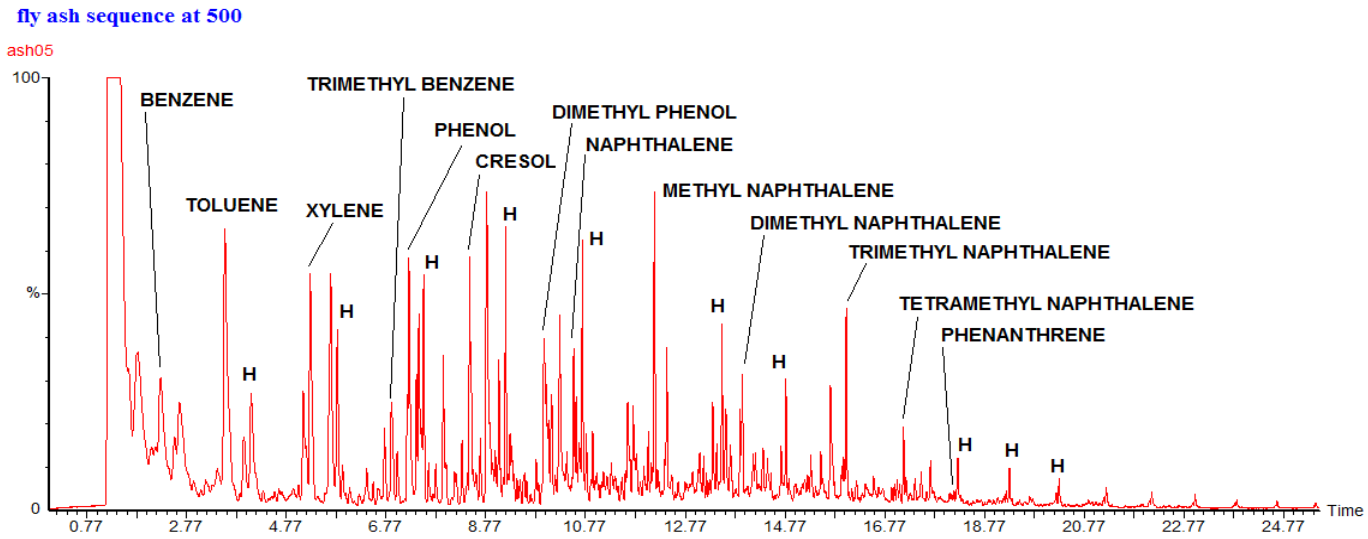

Figure 2. Run #5, 500°C for 15 seconds. Normal hydrocarbons are marked "H".

Instrument Conditions
Pyroprobe

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/MS

Column:	5% phenyl (30m x 0.25mm)
Carrier:	Helium, 50:1 split
Injector:	300°C
Oven:	40°C for 2 minutes
	10°C/min to 300°C
Mass Range:	35-550

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.