CDS solutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Py-GC/MS and Fixed Gas Analysis of Coal

Coal is a highly crosslinked natural polymeric material with considerable aromatic content, generally opaque and brown or black, and consequently difficult to analyze chemically. Analytical pyrolysis, however, with GC or GC/MS is applicable, frequently at relatively high temperatures since the aromatic content of the coal makes it fairly thermally stable.

The Pyroprobe 5200 may be configured to collect the pyrolysis products onto a sorbent trap before transferring them to the GC, to facilitate analysis in reactant gases or at elevated pressures. Fixed gases like carbon monoxide and methane pass through the trap, and may be analyzed using the Model 5500 Fixed Gas Analyzer, which incorporates a sample loop, packed column and TCD. Combination of the Pyroprobe 5200 with a GC/MS and the 5500 FGA system provides information on both the principal organic products of pyrolysis and the gases produced.

Figure 1 shows the pyrolysis-GC/MS analysis of a sample of coal heated to 800°C. There is considerable aromatic content, including phenolics, as well as a series of aliphatic compounds eluting later in the pyrogram.

Figure 2 shows the analysis of the fixed gas compounds that passed through the trap and into the sample loop of the 5500. In addition to CO, methane and CO2, there are peaks for water and even ethane and ethylene.

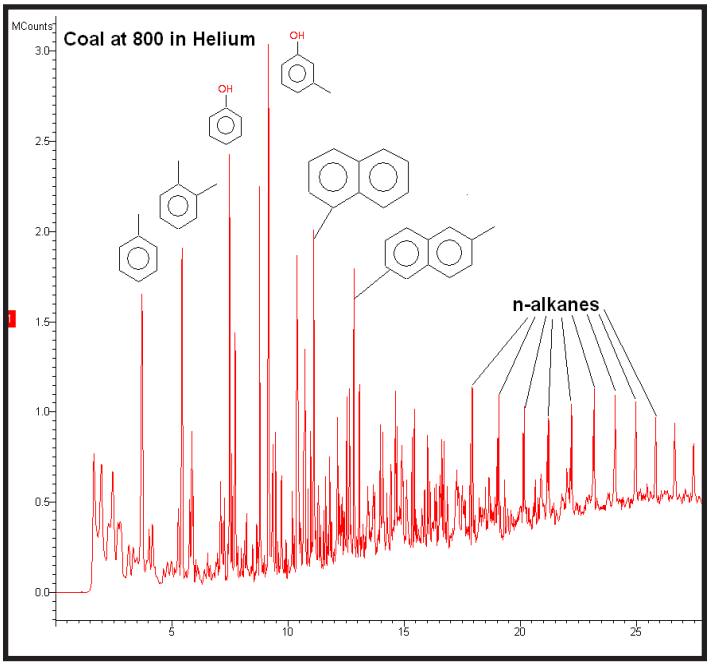

Figure 1. Py-GC/MS of coal at 800°C.

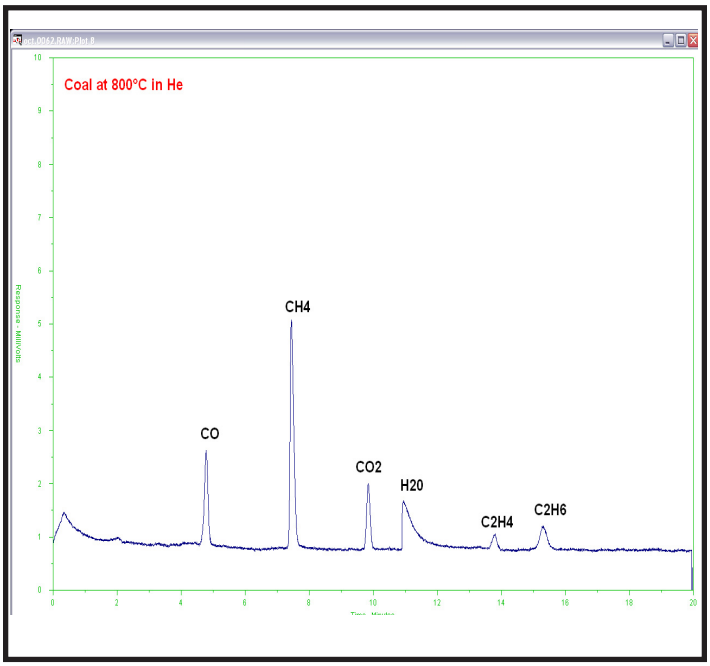

Figure 2. Fixed gas analysis of coal at 800°C.

Experimental Parameters

All samples were pyrolyzed using a CDS Pyroprobe 5200 equipped with a Tenax trap.

Pyroprobe

Pyrolysis:	750°C for 15 seconds
Interface:	300°C for 4 minutes
Carrier flow:	30 ml/min
Trap initial:	40°C
Trap desorption:	300°C for 4 minutes

GC/MS

Column:	30 m x 0.25 mm 5% phenyl MS
Carrier:	Helium
Split:	50:1
Oven program:	
	40°C for 2 minutes
	10°C/minute to 325°C

Fixed Gas Analysis

Column:	Carboxen 1000 1/8" X 9 "
Detector:	TCD
Oven:	30°C for 2 minutes, then
	30°C/min to 300°C

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

G. A. Gtirtizu' et al, Mathematical modeling of thermal decomposition of coal, J. Anal. Appl. Pyrolysis 71(2004) 537—551

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.

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