

CDSolutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Pyrolysis of Coal Under Steam and Elevated Pressure: PY-GC/MS and FGA

The Pyroprobe 5200 HP Steam Unit is designed to collect pyrolysis products onto a sorbent trap before transferring them to the GC, to facilitate analysis in steam and 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 includes a sample loop, packed column and TCD. A combination of the Pyroprobe 5200 with a GC/MS and the 5500 FGA system produces information on both the major organic pyrolysis products and the fixed gases produced.

Samples of coal were pyrolyzed at 1200°C at 250psi using CDS Model 5200HP Steam system, both with steam, and without steam. Figure 1 has GC/MS results. Aromatics normally associated with coal, like benzene, toluene, and xylene are present in both pyrograms. Phenols are also generated, but the amount is substantially reduced when steam is added.

Figure 2 shows the analysis of the fixed gas compounds that passed through the trap and into the sample loop of the 5500. More carbon monoxide, carbon dioxide and methane are produced with steam. Table 1 presents the amount of each gas generated per gram of coal pyrolyzed.

Fixed Gas	mL/g coal	
	No Steam	Steam
CO	0.50	3.71
CH4	0.59	3.92
CO2	0.71	4.68

Table 1: mL of Fixed gas per g of coal.

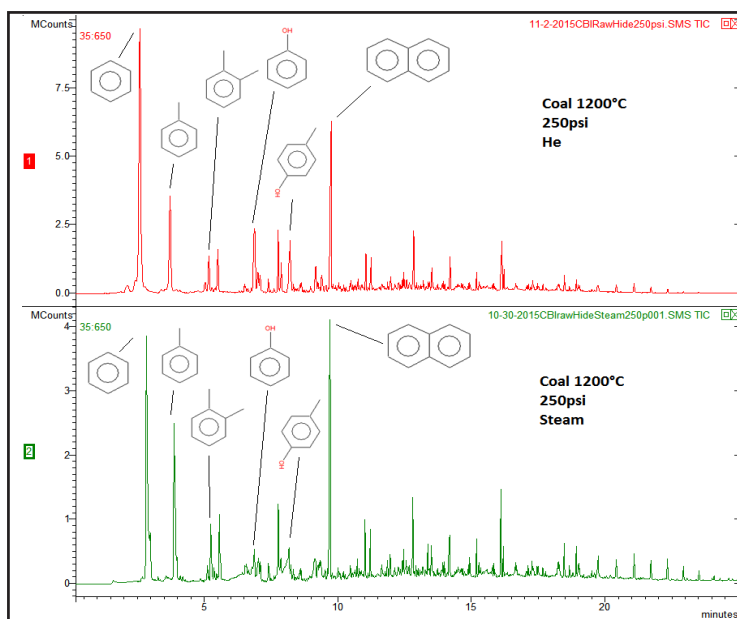


Figure 1: GC/MS of Coal at 250psi with and without steam.

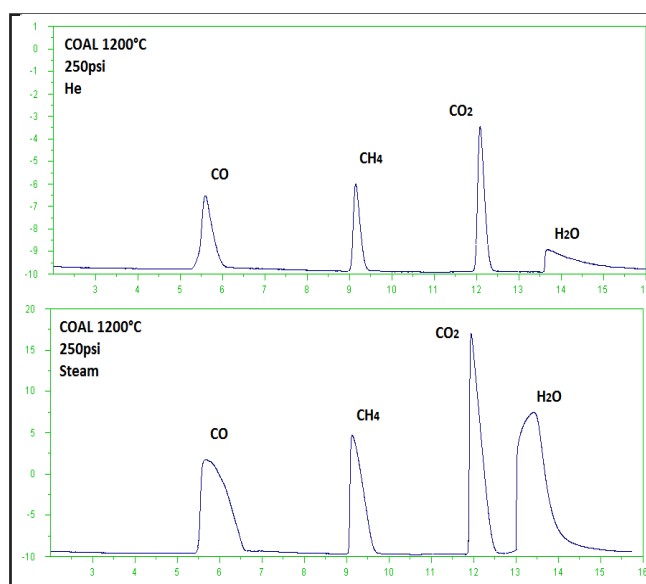


Figure 2: Fixed Gas analysis of Coal.

Equipment

This sample was analyzed using a CDS Model 5200HP Pyroprobe Steam interfaced to a gas chromatograph/mass spectrometer.

Pyroprobe

Pyrolysis: 1200°C for 60 seconds
Interface: 300°C for 7 minutes
He Purge Flow: 50 ml/min
Reactant Gas: (Steam) 0.02mL/min
Pressure: 250psi
Trap initial: 40°C
Trap desorption: 300°C for 7 minutes

GC Conditions

Carrier: Helium
Injector: 300°C
Split: 50:1
Column: 5% phenyl (30m X 0.25mm)
Detector: Ion Trap MS
Range: 35 - 550

Oven:
Initial: 40°C for 2 minutes
Ramp: 12°C/min.
Final: 300°C

Fixed Gas Analysis

Column: Carboxen 1000 1/8" X 9"
Detector: TCD
Oven: 40°C for 1 minutes, then
20°C/min to 275°C

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

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 as well as purge & trap instruments for drinking and waste water. CDS also manufactures the Dynatherm line of thermal desorption instruments including the 9300 series for air monitoring and the 7500 autosampler. 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 www.cdsanalytical.com.