CDS olutions

APPLICATIONS INFORMATION USING ADVANCED SAMPLE HANDLING TECHNOLOGY

Four Temperature Analysis of a Biomass Feedstock

In the production of bio-oils a variety of starting materials has been used, including wood and grasses like switchgrass. An attractive source of feedstock lies in agricultural or industrial waste products such as forrest litter, tree trimmings, sawdust, shells and fruit pits.

The use of the stones from olives has been investigated as well, which could solve a disposal issue and provide a useful product. Olive stones, like much biomass, is a lignocellulosic product, meaning that it contains both cellulose and lignin. These biopolymers pyrolyze readily, each producing characteristic compounds. Cellulose is a glucose polymer and produces a variety of oxygenated compounds, including furans and levoglucosan. Lignins are phenolic in nature, differing substantially from plant to plant, and pyrolyze to produce phenolic compounds, including syringol, guaiacol, and even vanillin.

The production of volatiles from olive stones is shown here by heating the powdered stones sequentially to four temperatures. At 150°C, a peak is observed for acetic acid, but little else. At 300°C, cellulose produces more acetic acid, and furfural, while the lignin is beginning to degrade, producing phenolics, including syringol.

At 450°C the syringol is more pronounced, as are other phenolics, and furfuryl alcohol is seen from the cellulose. Finally, at 750°C the remaining material is pyrolyzed, producing more guaiacol and levoglucosan from the cellulose. Overall through the progression of temperatures, the production of larger molecules is favored at lower temperatures, with smaller molecules increasing as the temperature is increased.

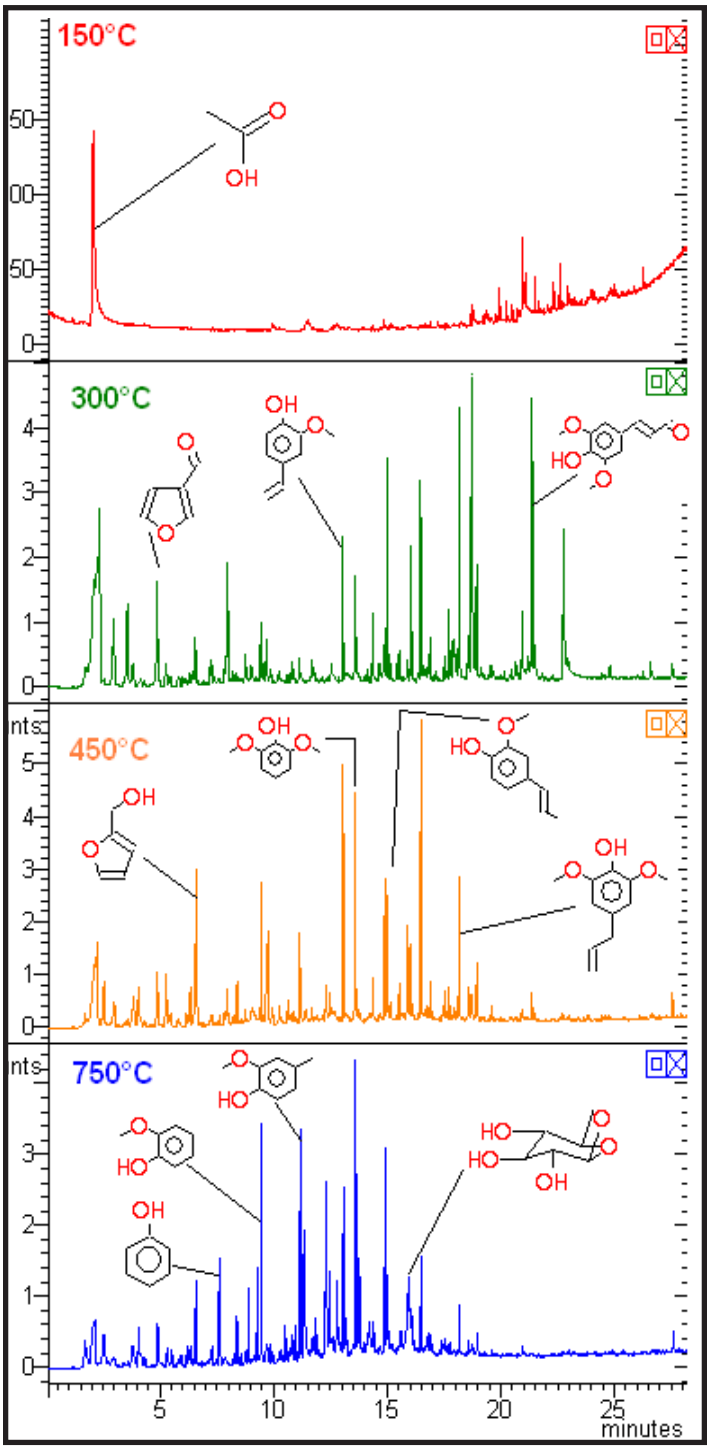

Figure 1. Powdered olive stone heated to 150°, 300°, 450° and 750°C, sequentially.

Experimental Parameters

All samples were pyrolyzed using a CDS Pyroprobe 5250 Autosampler, equipped with a Tenax trap.

Pyroprobe

Pyrolysis:	150°, 300°, 450°, 750°C for 20 seconds
Valve oven:	300°C
Carrier flow:	30 ml/min
Trap initial:	40°C
Trap desorption:	300°C for 4 minutes
Transfer line:	300°C

GC/MS

Column:	30 m x 0.25 mm 5% phenyl MS
Carrier:	Helium
Split:	75:1

Oven program:
40°C for 2 minutes
10°C/minute to 325°C

Scan range: 35 to 550 AMU

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

A.A. Boateng, H.G. Jung, P.R. Adler, Pyrolysis of energy crops including alfalfa stems, reed canarygrass, and eastern gamagrass.
Fuel 85 (2006) 2450–2457

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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