



## Four Temperature Analysis of a Biomass Feedstock

### Application Note

#### Energy

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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 forest 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.

#### Instrument Conditions

##### Pyroprobe

Filament: 150°, 300°, 450°, 750°C  
for 20 seconds

Trap desorption: 300C for 4 minutes

Valve Oven: 300°C

Transfer Line: 300°C

##### GC/MS

Column: 5% phenyl (30m x 0.25mm x 0.25µm)

Carrier: Helium, 75:1 split

Inlet: 300°C

Oven: 40°C for 2 minutes

10°C/min to 325°C

Mass Range: 35-600 amu

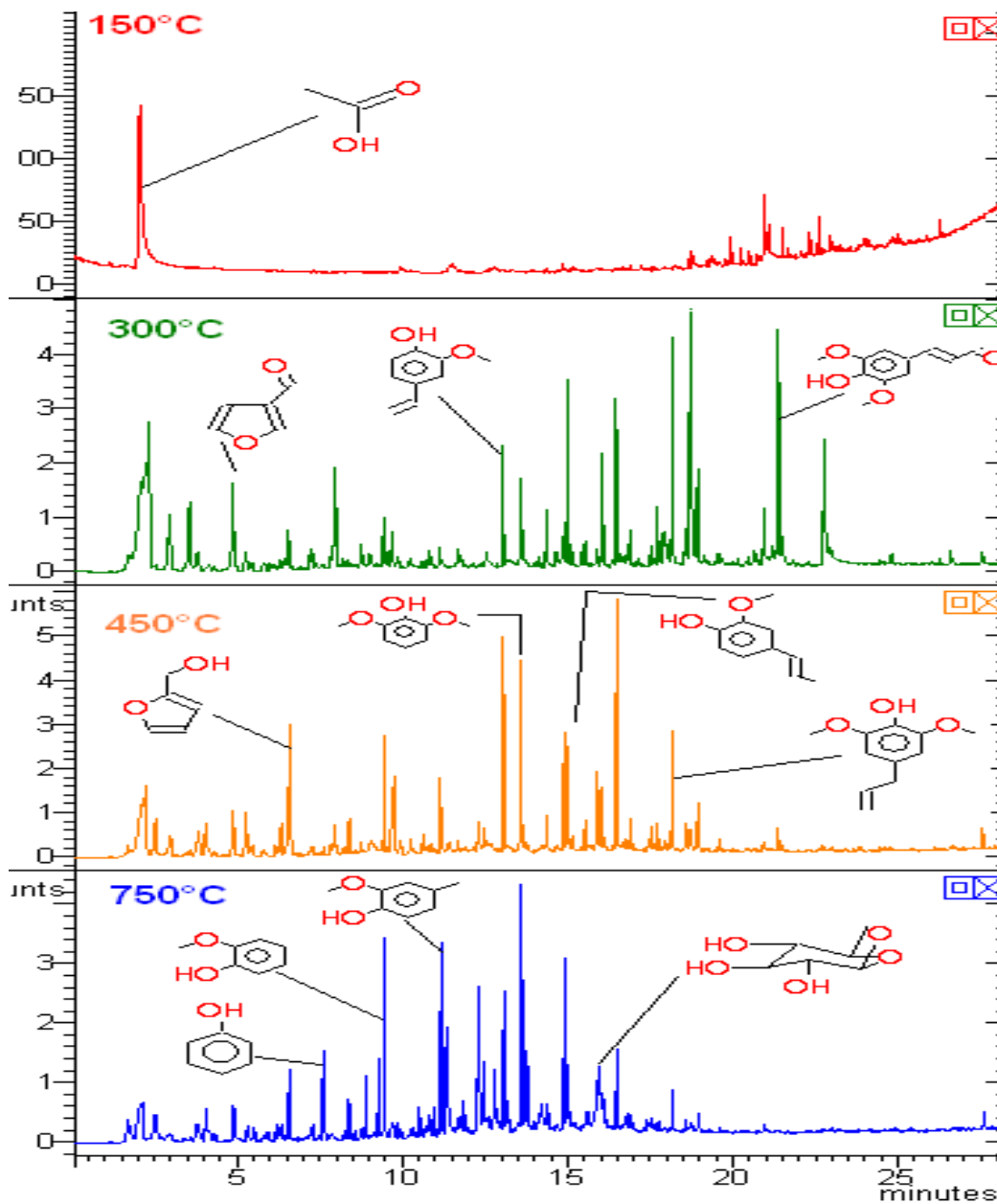


Figure 1. Powdered olive stone heated to 150°, 300°, 450° and 750°C, sequentially.

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