# Pyrolysis of Oil Shale in Hydrogen at Elevated Pressure

## Application Note

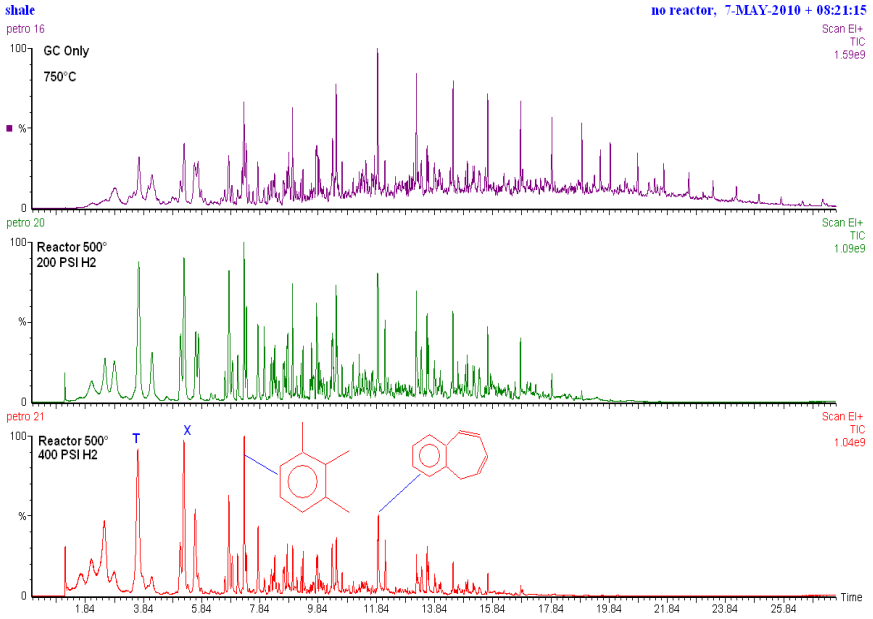
Energy

**Author:**

T. Wampler

The oil content in source rocks like shale has long been determined using analytical pyrolysis. The ground rock is heated, releasing the petroleum compounds, which are then transferred to the GC for analysis. Typical results look like the top chromatogram in the figure below, showing a series of long chain aliphatics interspersed with aromatics and branched compounds.

This same process may be used as the sample preparation step in a more sophisticated analysis that adds the ability to operate at elevated pressure and send the products through a catalytic reactor for conversion. In the middle chromatogram, the same shale has again been pyrolyzed, but this time in hydrogen at 200 PSI. The pyrolysis products are then carried through a platinum reactor where double bonds are reduced. In addition, further cracking takes place in the reactor, and there is some conversion to aromatics. This is mainly caused by the elevated pressure, as seen in the lower chromatogram, in which the hydrogen pressure is 400 PSI and the production of aromatics is further increased.




### Instrument Conditions

**Pyroprobe HP-R**

| | |
|---|---|
| Interface: | 325°C for 4 minutes |
| Pyrolysis: | 750°C for 15 seconds |
| Valve oven: | 325°C |
| Trans. line: | 325°C |
| Reactor: | 500°C, Platinum |
| Pressure: | 200 PSI, 400 PSI |
| Carrier: | Hydrogen |
| Flow: | 40 ml/minute |
| Trap: | 325°C for 4 minutes |

**GC/MS**

| | |
|---|---|
| Column: | 30m x 0.25 mm 5% phenyl |
| Carrier: | Helium, 50:1 split |
| Injector: | 325°C |
| Program: | 40°C for 2 minutes,<br>10°/min to 300°C |
| Mass range: | 35 to 600 AMU |

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

Chemical examination of some petroleum source rocks by laser pyrolysis mass spectrometry and flash pyrolysis gas chromatography mass spectrometry, Greenwood, P., Sherwood, N. and Willett, G., J. Anal. Appl. Pyrolysis, 31 (1995) 177-202.