

U.S. DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY



## REAL TIME, IN-SITU LASER SENSOR FOR FEEDSTOCK MONITORING IN GASIFIERS

### Description

Energy Research Company (ERCo) is developing a laser-based technique for simultaneously measuring in-situ and in real time the heating value, nitrogen, sulfur, ash, and trace metal content in coal gasifier feedstocks. A sensor based on the technology can be used on both dry and slurry feedstocks and can also be integrated into conventional coal feed equipment.

The sensor utilizes a technology known as Laser Induced Breakdown Spectroscopy (LIBS). The implementation of LIBS in a gasifier is shown schematically in Figure 1 below. A laser beam is directed onto the surface of the coal as it is being fed into a gasifier. The laser vaporizes and ionizes micrograms of the feedstock. After a few microseconds the resulting plasma cools, whereupon the emitted radiation is collected by a spectrometer. The spectrometer records the wavelengths and intensities of peaks in the recorded spectrum. These peaks' wavelengths uniquely identify the elements present in the feedstock, and the peaks' intensities correlate with the corresponding elements' concentrations.

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### PROJECT COST

\$850,000 (SBIR Phase I and II)

### PROJECT DURATION

07/01/2002 – 06/30/2005

### WEBSITES

[www.netl.doe.gov/coal](http://www.netl.doe.gov/coal)

[www.sc.doe.gov](http://www.sc.doe.gov)

### Accomplishments

Laboratory measurements have demonstrated that a LIBS system can accurately measure heating value and the major coal constituents: carbon, nitrogen, oxygen, hydrogen, and sulfur. In addition, the following ash constituents have been measured: calcium, aluminum, iron, potassium, magnesium, sodium, silicon, and titanium. Innovative techniques to extend LIBS' capabilities to measuring trace constituents, such as mercury, are also yielding promising results. Work is proceeding on designs to permit the use of the system for real time measurement of coal feedstock.

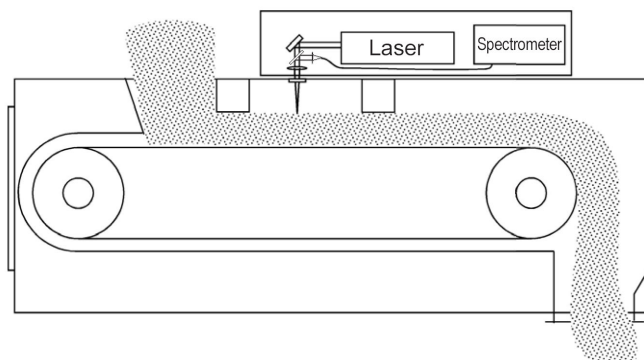


Figure 1. Schematic of LIBS System Integrated with a Coal Feeder

