MEASURING HYDROCARBON FEATURES IN COAL WITH HIGH RESOLUTION SPECTROSCOPY

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Geologist
Spectral Evolution
• Incorporated June, 2004
• Manufacturing facility in Lawrence, Massachusetts
• Full line supplier of UV-VIS-NIR spectrometers for field portable mineral identification, core logging, remote sensing, and general photonics applications
COAL INDUSTRY IN UNITED STATES PICKING UP

- Expected to play a leading role for many years to come
- Coal mining in the U.S. rose by 19% last year - according to the U.S. Department of Energy data
- #1 source of electricity production in the U.S. during 1st half of 2017 – according to the U.S. Energy Information Administration (EIA)
- U.S. has 262 billion tons of recoverable coal reserves, according to EIA – that’s a 235 year supply @ current rate of use
NEED FOR NEW TECHNOLOGY AND CONCEPTS

- Demand has risen in U.S. and other countries such as China, India and Europe – new technology for exploration is needed for faster results, less financial burden.
- Surface mining for coal has more advantages compared to underground mining – coal recovery for economic gain is ~85%-90%.
- New concepts for classifying coal quality in field are needed.
  - Coals in U.S. are classified by rank – defined as “the degree of metamorphism or progressive alteration the natural series from lignite to anthracite”.
  - Major role in distinction of coal is hydrocarbon content as well as differing concentrations of the important elements such as Sulfur or Chlorine.
  - Using technology in field to identify coal features such as hydrocarbon features and/or other signatures is needed for viable and fast results to compliment lab assay is important.
SR-6500 ULTRA HIGH RESOLUTION SPECTRORADIOMETER

Spectral Range: 350-2500nm
Spectral Resolution:
1.5nm @ 700nm
3.0nm @ 1500nm
3.8nm @ 2100nm

Sample provided by Tennessee Valley Authority – Paradise Fossil Stockpile in Kentucky, US
SAMPLE SET: UNITED STATES
DEPT OF INTERIOR – BUREAU OF LAND MANAGEMENT

• Administer mining on federal land
• Samples locations from Colorado, USA
SAMPLE SET:
TENNESSEE VALLEY AUTHORITY

- Provide electricity from different resources, including coal.
- Samples locations from Kentucky, Wyoming, and Illinois

Graph:
- Paradise Fossil Stockpile, KY
- North Antelope Rochelle Mine, WY
- Illinois Basin, IL
CASE STUDY FROM PLOTLOGIC

• Based in Brisbane, Australia

• Develop and implement high quality ore characterization systems for the mining industry

• Australia’s coal industry is also seeing an increase in demand, 4th highest coal exporter in the world

• Plotlogic using SR-6500 to build a quantification model for classifying different grades of coal based on features found within coal

• Apply new concept of classifying coal in the field for exploration and analysis

• Research is ongoing in the commercial mining industry in Australia
CONCLUSION

- Using a high resolution spectrometer to identify hydrocarbon features yields promising results for the coal industry:
  - Clearly pick out hydrocarbon features
  - Difference in shape and depth of features based on grade

- Further research is needed and is in process:
  - Create a quantification to depict where/why certain features occur within different grades of coal, create a standard for widespread use amongst industry worldwide
  - Use of the information for more accurate results in the field and to improve lab analysis efficiency