

# Kansas State University

## Analytical Characterization Equipment

Students wanting to use the equipment listed should contact:

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The FTIR Spectrum 400 (funded by DOE) combines mid-infrared (MIR) and Near-infrared (NIR) spectroscopy in a single instrument with automatic beam splitter changeover.

Quickly obtained MIR and NIR spectra can provide rapid identification of key functional groups in sample molecules.



With proper column, temperature program, and corresponding standards, this Agilent GC/MS (funded by DOE) can qualitatively detect and quantitatively determine pg to ng levels of almost any volatile and semi-volatile compounds.

The Karl Fisher titrator (funded by DOE) can accurately and selectively determine small amount (mgs) of water quickly (min);

Very good for low moisture samples and troublesome samples with other moisture determination methods.



Coupled with Agilent GC/MS, the CDS Pyroprobe 5250 (funded by DOE) is a very useful instrument to study thermal degrading products of organic materials at various heating conditions (heating temperature and duration).

The PerkinElmer 2400 element analyzer (funded by DOE) can accurately and precisely analyze  $\mu\text{g}$  to  $\text{mg}$  of either CHNS element or O content in organic materials when appropriately configured within 4-8 min.

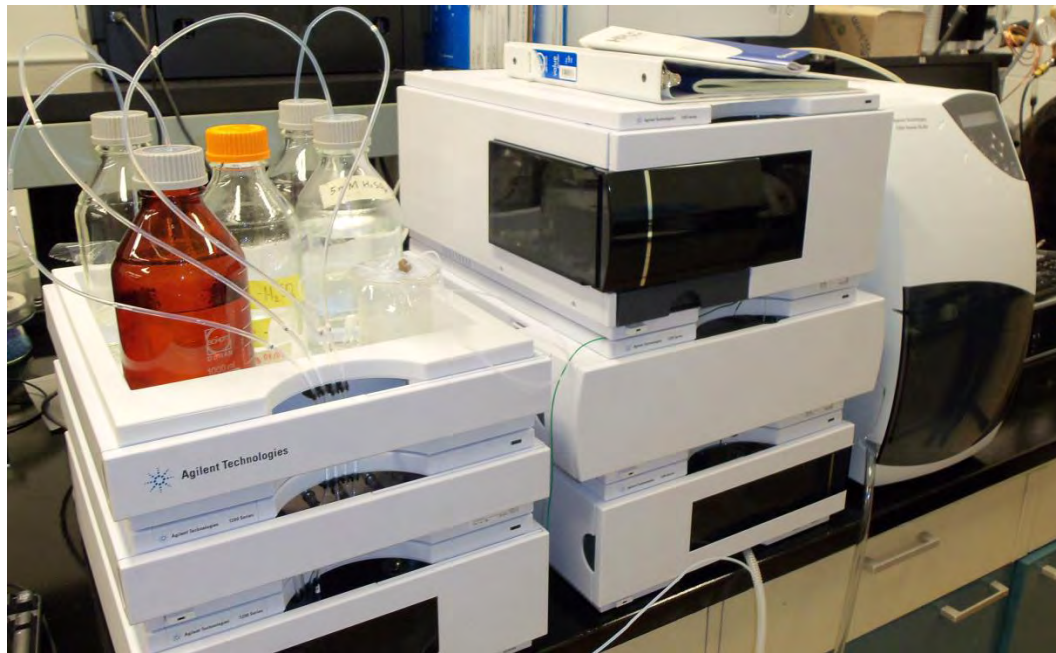




With a UV detector and a universal mass refractory index detector (funded by the USDA) this Shimadzu HPLC has been a workhorse for our bioconversion research.

It can be used to analyze almost any soluble compounds HPLC can separate.

In our lab, we routinely analyze monosaccharide sugars, organic acids, ethanol and other compounds of interest in biomass analysis, pretreatments, and fermentation process.



This equipment was funded by DOE.



With a powerful DAD (diode-array detector) and a sensitive universal mass ELSD (evaporative light scattering detector) this Agilent HPLC system can be used to analyze any compound that is less volatile than the mobile phase. In our lab, we mostly use HPLC for the analysis of monosaccharide sugars, organic acids, lipids, and inhibitors from biomass pretreatment, etc.



This equipment was funded by USDA.



The Labconco Laminar hood is a safe place for microbiological and genetic engineering work.

The heating units and solvent-extraction system are vital part of the chemical composition analysis of biomass for both pretreatment and utilization.



Buchi Rotavapor R210 with automatic vacuum controller allows efficient and gentle evaporation of solvents.





The newly built fast pyrolysis unit is designed for quickly convert sorghum biomass into bio-oil and bio-char.

The designed operating temperatures are 500-900 °C.

This piece of equipment was funded by the  
Kansas Agricultural Experimental Station



The Parr high temperature high pressure reactor (funded by Kansas Agricultural Experimental Station) is very versatile equipment for pretreatment of biomass, especially for dilute acid and liquid hot water pretreatments.

With some modification, the Parr reactor can also be used to do modified steam explosion treatment of biomasses.



The IKA Calorimeter system C200 (funded by DOE) can be used to determine the calorific values of organic materials (solids or liquid) by complete combustion of the sample in pure oxygen environment.

The capacity of this C200 unit is max. 40,000 J of material, and each run takes approximately 8-17 min.



The BioFlo 3000 (funded by the USDA) bench-top fermentor (New Brunswick) can ferment up to 5 L of medium under controlled conditions (temperature, pH, agitating speed, and dissolved oxygen level). Data of all parameters during fermentation are recorded and saved in a computer.