NREL researchers perform biomass characterization in dedicated laboratories working with over $5 million in state-of-the-art analytical equipment.

A dedicated team of highly skilled analytical chemists with over 100 cumulative years of experience in characterization. They have three specialized laboratories with dedicated sample processing and advanced analytical equipment such as:

- High-performance liquid chromatography (HPLC) with various detectors (RID, DAD, ELSD)
- Ultra-high-performance liquid chromatography (UHPLC)
- High-performance anion-exchange chromatography with pulsed amphoteric detection (HPAEC-PAD)
- LC/ion trap MS
- GC/FID/MS
- Near-infrared (NIR) spectrometers
- Mass spectrometers: ion-trap, single quadrupole, triple quadrupole, ion-mobility quadrupole time-of-flight (IMS-qTOF), and quadrupole time-of-flight (qTOF)
- Single quadrupole and IMS-qTOF are both LC and GC compatible.

NREL’s Capabilities in Analytical Sciences Supporting Research and Development (R&D)

Core Capabilities

Biomass and Biochemical Characterization and Quantification

NREL develops, refines, and validates analytical methods to provide comprehensive, detailed, and accurate characterization and quantification of biomass-derived materials, such as feedstocks, process intermediates, and products. These methods include the characterization of bioprivileged molecules and detailed lignin characterization (lignomics).

Publicly Available Laboratory Analytical Procedures (LAPS)

NREL develops LAPS for standard biomass analysis and analysis of intermediates and products of biological conversion processes. These procedures help scientists and analysts understand more about the chemical composition of raw biomass feedstocks and process intermediates for conversion to bio-based chemicals and biofuels. These procedures are used worldwide and provided free to the public at: nrel.gov/bioenergy/biomass-compositional-analysis.html.

Near-Infrared Rapid Analysis

NREL analytical scientists use NIR spectroscopy correlated with compositional data, produced using traditional wet chemical techniques, to develop rapid calibration models. These models dramatically decrease the time required for—and the cost of—routine compositional analyses. NREL has models to predict the composition of a variety of biomass types and process intermediates. These models and the underlying data are available for license.
KEY RESULTS
Our analytical scientists are actively engaged with stakeholders in the bioproducts and biofuels community and are working with companies in a wide variety of different industries. This has resulted in work in recent years with over 100 external clients, including:

- Fortune 100 companies
- The petrochemical industry
- Agribusiness
- Life science, textile, and recycling companies
- Innovative start-ups
- Government organizations (e.g., National Institute of Standards and Technology, U.S. Environmental Protection Agency)
- International standards organizations (e.g., ASTM International)
- Academic institutions.

Recent Accomplishments in Characterization and Quantification
Highlights include:

- Collaboration with industry and ASTM International on development of analytical methods supporting cellulosic conversion in starch ethanol facilities.
- Recent publication of the “cis,cis- and cis,trans-Muconic Acid from Biological Conversion” LAP, the latest addition to the NREL suite of LAPs.
- In the biomanufacturing realm, scientists engineered Pseudomonas putida to produce 16 intermediates of aromatic catabolism and developed analytical methods to characterize and track these molecules throughout the integrated process from biology toward polymerization. Polymerization of several of these molecules generated performance-advantaged materials.

Highlighted Publications


Find Out More
Our team can work with you to characterize the chemical composition of biomass feedstocks, intermediates, and products. For more information and collaboration opportunities, contact:

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