

# IOWA

# Ratner Research Group



Researchers investigate the areas of droplet combustion, droplet splashing, combustion instability, settling characteristics of nanofluid/nanofuel, biomass combustion, and medical devices. A focus is optimizing the efficiency of fuel combustion in terms of cost, emissions, consumer safety and transportation safety. The lab focuses on process and performance analysis, as well as the optimization of biomass as a renewable energy source.

## Who We Work With

- U.S. Department of Energy
- Mid-America Transportation Center
- Department of Transportation

## Lab Director: Albert Ratner



- Professor of Mechanical Engineering, University of Iowa
- PhD: Aerospace Engineering, University of Michigan
- MS: Mathematics, University of Michigan
- MS: Aerospace Engineering, University of Michigan

# IOWA

Technology  
Institute

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# RESEARCH FOCUS & HIGHLIGHTS

## Droplet Combustion Research

- Analyzing the splashing and burning properties of various fuels using a high-speed camera to image such behavior and how they change with the addition of polymeric and nanomaterial additives.
- Experimentations on the emulsion of fuels, the settling characteristics of different nanofuels/nanofluids, and fuel emulsion stability.

## Combustion Instability Research

- Analyzing various aspects of low-swirl combustion using a Planar Laser-Induced Fluorescence (PLIF) and how various acoustic instabilities can be created and eliminated in such combustion regimes.
- Measuring the dynamic behavior of flames and how they change in response to changing flow conditions with laser diagnostics and specialized high-speed cameras.
- Experimentations performed in a one-of-a-kind elevated pressure combustion-acoustics chamber build understanding of the precursors to combustion instability, which is an important issue in modern gas turbine design, while advanced laser diagnostics measure the resulting changes in flame behavior.

## Biomass Combustion Research

- Analyzing various aspects of biomass combustion using micro-gaschromatographs.
- Testing different fuels, such as Miscanthus grass and oat hulls, and studying their co-burning with fuels such as coal and natural gas.
- Time-evolving gasification measurements are made in a quartz tube gasifier, and the resulting chemical species are measured with solid state detectors. Computer models of real systems incorporate the information.

## Medical Device Research

- Collaborative research related to artificial heart and mechanical circulatory devices.

## LEARN MORE



### SCHEDULE A VISIT

by contacting Albert Ratner at [albert-ratner@uiowa.edu](mailto:albert-ratner@uiowa.edu) or 319-384-0883



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