Ames Laboratory

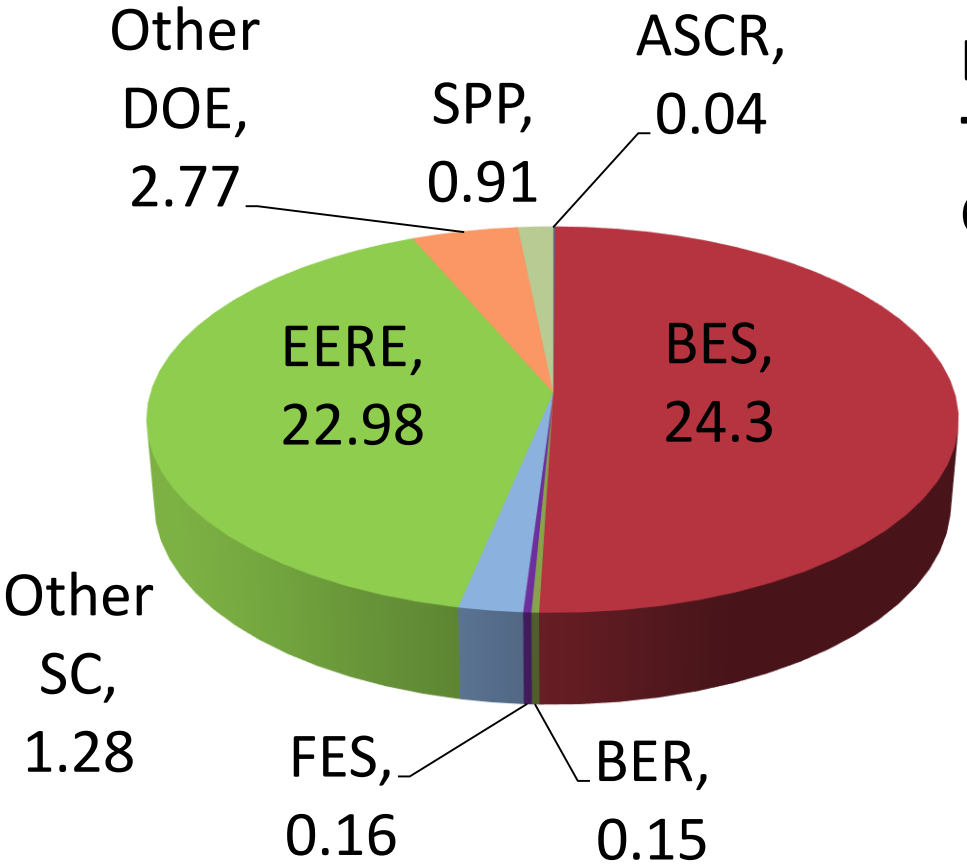
Adam Schwartz, Director

BERAC Meeting

March 22, 2016

Laboratory mission and overview

The Ames Laboratory creates materials, inspires minds to solve problems, and addresses global challenges



Location: Ames, IA
Type: Single-program
Contractor: Iowa State University

FY 2015 Operating Costs: $57.0M

Core capabilities: research & facilities

- Key Research Capabilities
  - Analytical instrumentation and technique development
  - Catalysis
  - Computational chemistry and materials science
  - Energy conversion materials
  - Ionic liquids

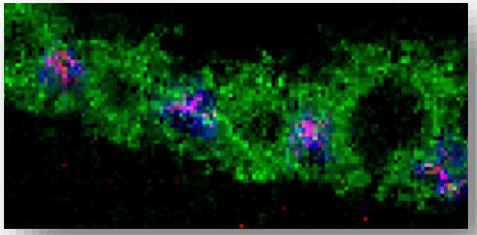


Image overlay HMBOA-Glc (blue), DIMBOA-Glc(red), and SQDG(34:3) (green)

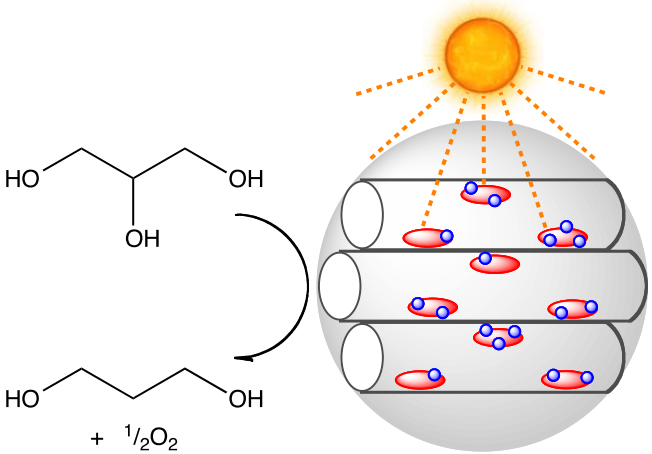
Sensitive Instrument Facility

- Key Facilities
  - Imaging
    - *In situ* liquid cell electron microscopy
    - Mass spectrometry
    - Subdiffraction optical imaging
  - Solid-state NMR
    - 2D and 3D conventional SS-NMR
    - Dynamic nuclear polarization SS-NMR

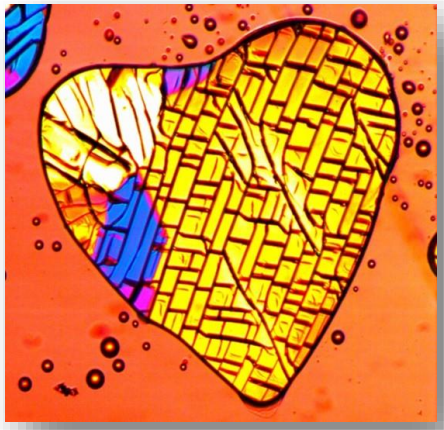
DNP SS-NMR

Future strategic science priorities

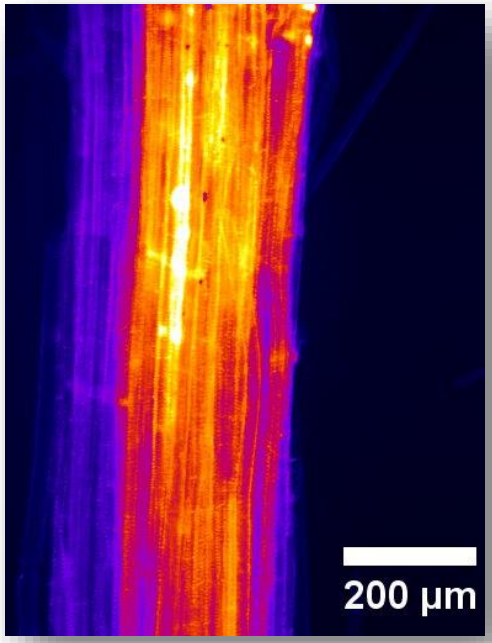
1. Understanding the function of chemicals in plants and microbes, including developing "functional bioreporters"
2. Deconstruction and conversion of lignocellulosic materials
3. Advancement of environmentally friendly ionic liquids for separations in the context of bioremediation



Photocatalytic deoxygenations



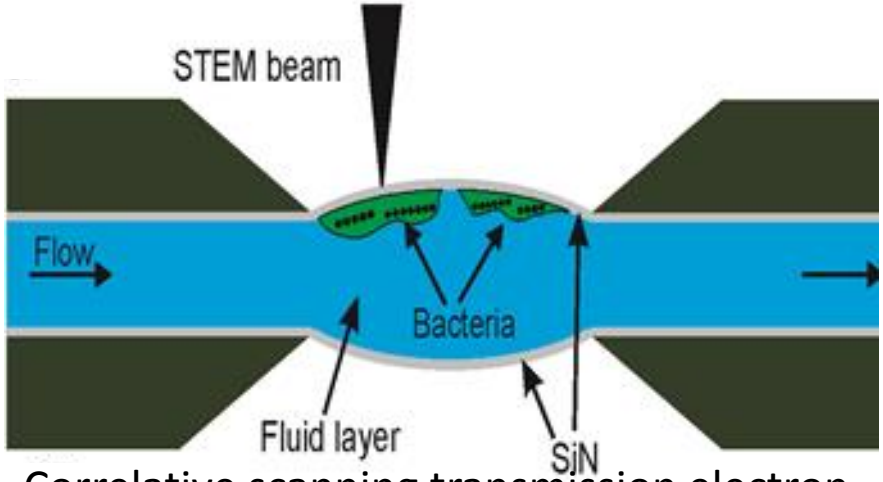
Ionic liquid with liquid crystalline properties



Fluorescence image of Arabidopsis root injected with Ac-BODIPY dye. Individual cells can be differentiated.

Future strategic partnerships

- Partnerships to develop *in situ* imaging methods to study microbially-assisted degradation of waste biomass.
- Partnerships to develop methods to convert waste biomass to fuels or starting materials for chemical, enzymatical or microbial conversion to higher value chemicals.



Correlative scanning transmission electron microscopy high-angle annular dark field and fluorescence microscopy imaging