

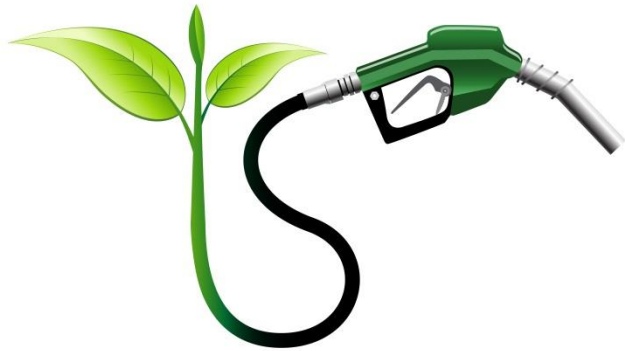
BIOFUELS GROUP



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What does this group do?

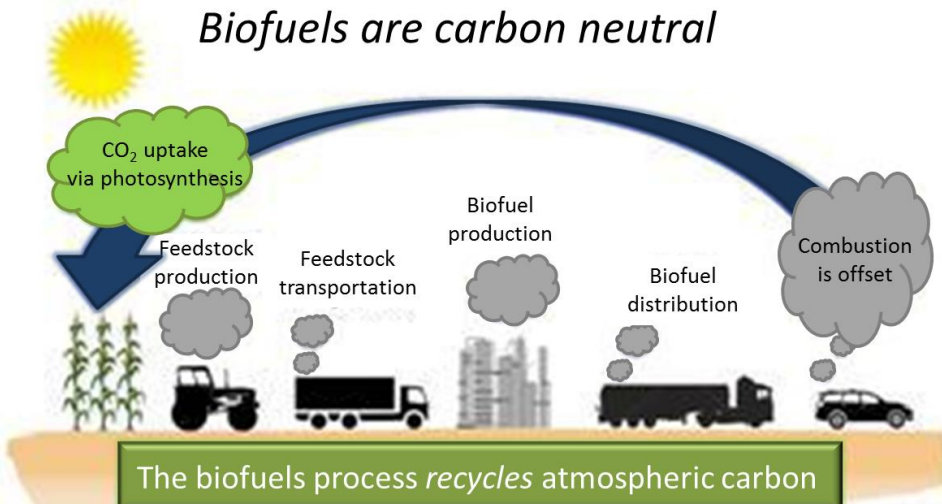


BIOFUELS RESEARCH!

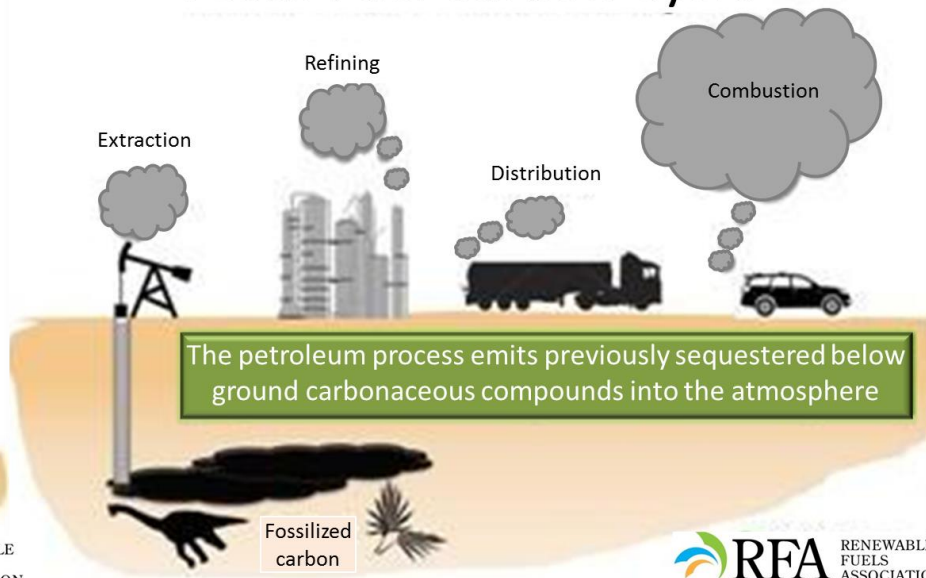
- **What are biofuels?** Fuels made from biomass.
- **What is biomass?** All material that comes from living things like plants and animals.
- **Why are biofuels better than fossil fuels?**
 - ✓ *Biofuels are renewable!* The source that they come from – biomass – can regenerate quickly.
 - ✓ *Biofuels avoid carbon pollution!* The carbon dioxide put into the air when biofuels are made and used is taken out of the air by plants as they grow.

Biofuels Carbon Cycle

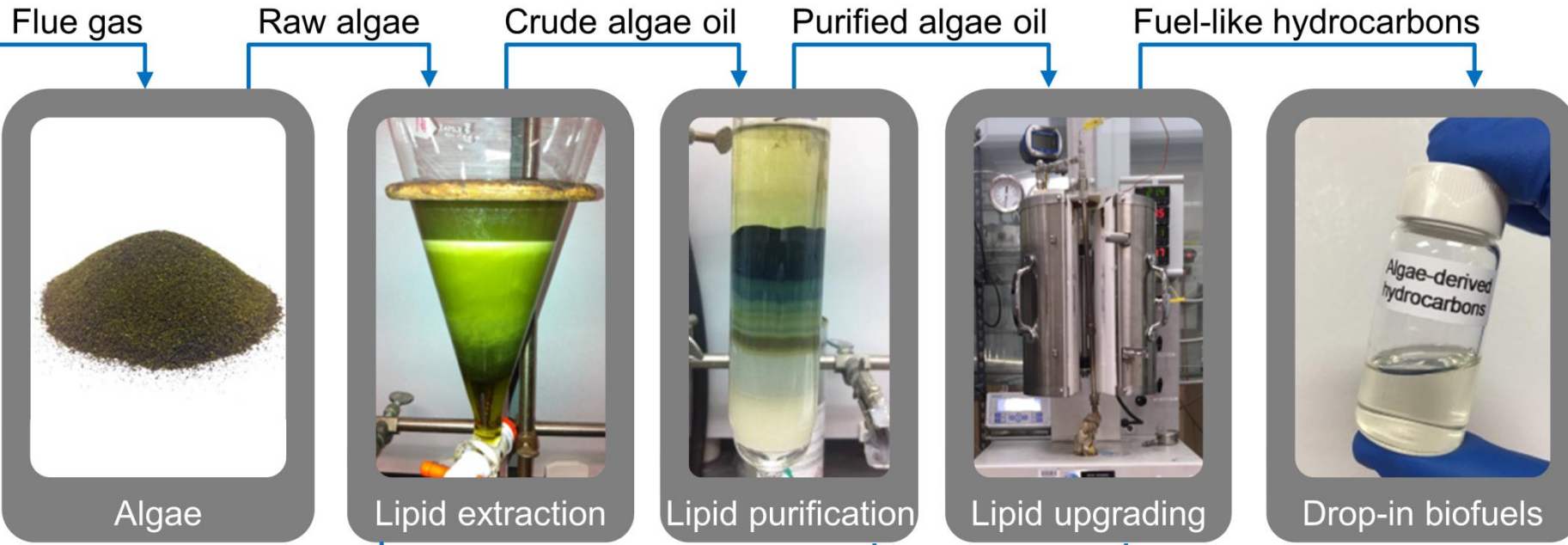
Biofuels are carbon neutral



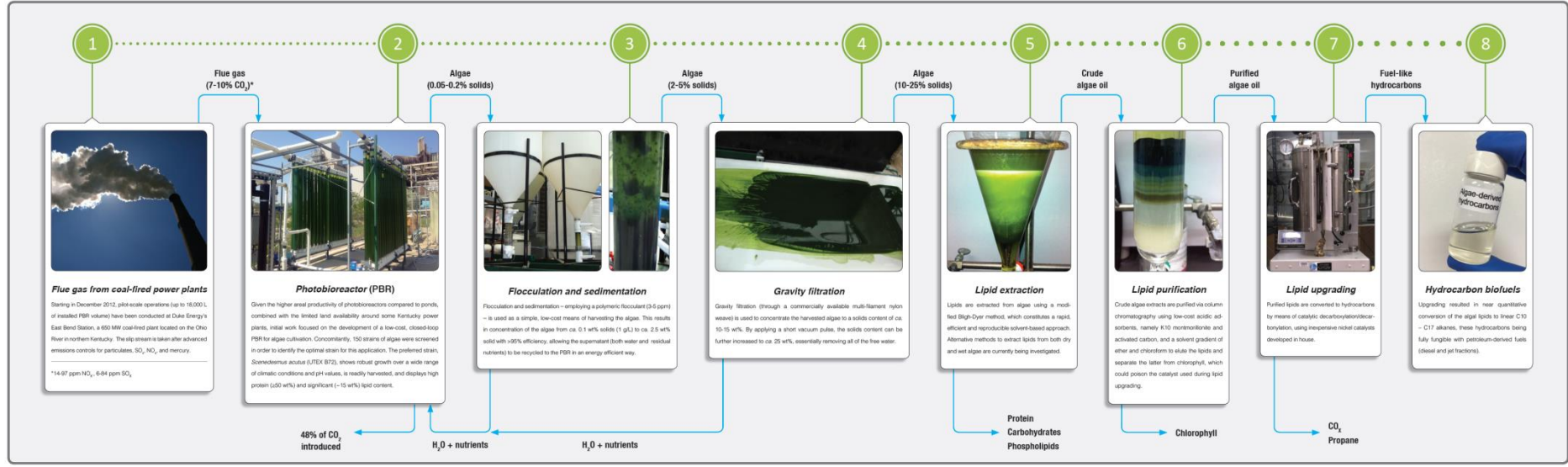
Fossil Fuel Carbon Cycle



Ongoing projects: Algae



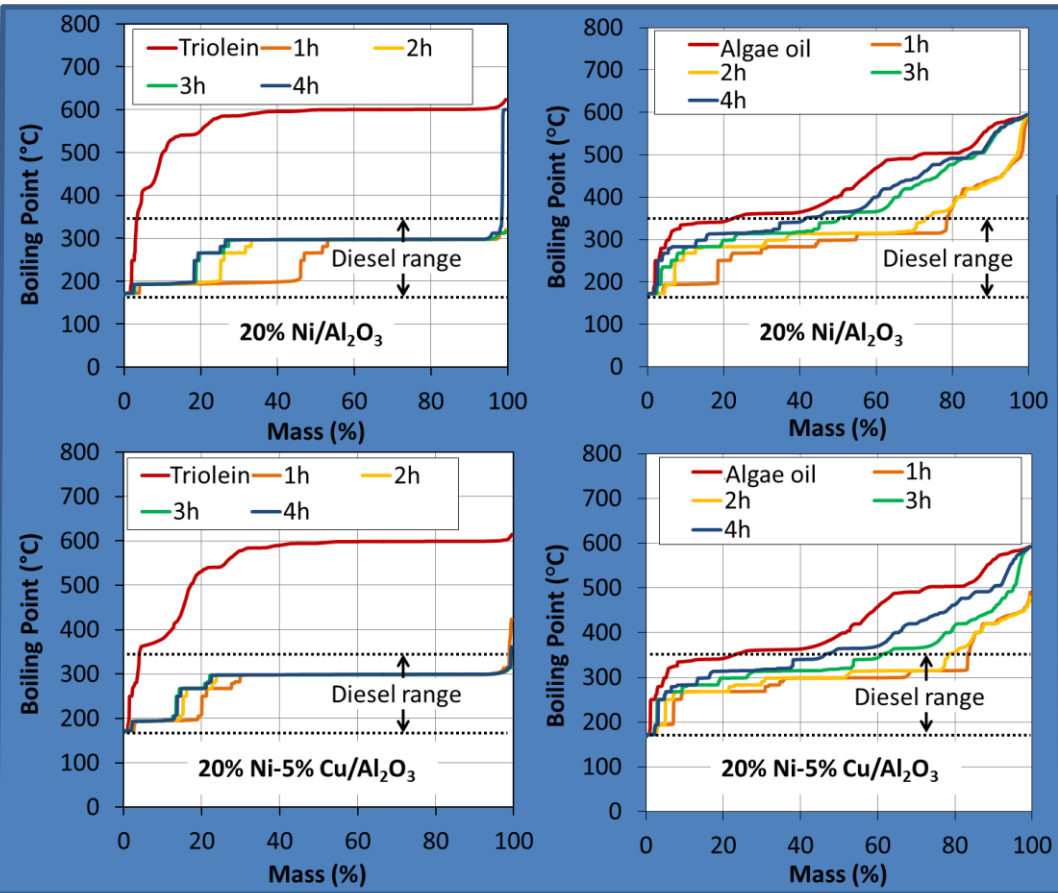
Protein, phospholipids, etc. Chlorophyll CO_x & propane



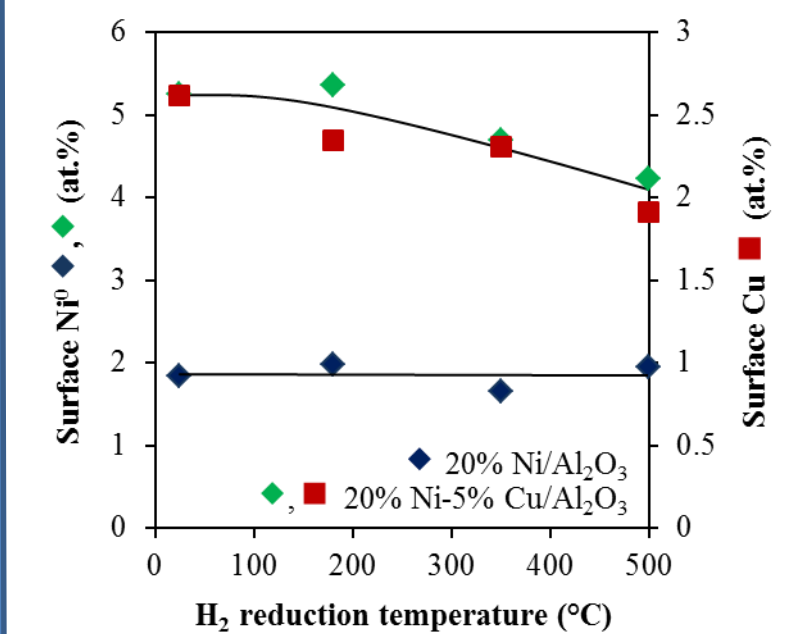
Ongoing projects: Catalysis

Semi-batch deoxygenation of tristearin over Ni-containing catalysts at 260 °C

Catalyst	Conversion (%)	Selectivity to C10-C17 (%)	Selectivity to C17 (%)
20% Ni/Al ₂ O ₃	26	87 [23]	72 [11]
20% Ni-1% Cu/Al ₂ O ₃	29	94 [24]	56 [16]
20% Ni-2% Cu/Al ₂ O ₃	85	95 [80]	65 [56]
20% Ni-5% Cu/Al ₂ O ₃	>99	99 [98]	71 [71]



Boiling point distribution plots of two feeds and their continuous deoxygenation products at 260 °C



Catalyst characterization via XPS

What skills and expertise can you acquire?

• Chemical Engineering

Algae

- Reactor design
- Reactor operation
- Power Plant Integration

Catalysis

- Experiment design
- Reactor operation
- Processing and analysis

• Materials Engineering

Algae

- Reactor cost reduction
- Materials optimization
- Materials interactions

Catalysis

- Catalyst synthesis
- Catalyst characterization
- Materials development

• Biosystems Engineering

Algae

- Algae culturing
- Algae processing
- Algal biofuels synthesis

Catalysis

- Biofuels synthesis
- Analysis of feeds and products
- Biomaterials processing

• Mechanical Engineering

Algae

- Equipment design
- Parts development
- Reactor construction

Catalysis

- Equipment design
- Equipment modifications
- Equipment repair and upkeep

Additional info

- **Where does the biofuels group get funding from?**

National Science Foundation

U.S. Department of Energy

KY Dept. of Energy Development & Independence

U.S.-China Clean Energy Research Center

- **Where does the biofuels group publish?**

Chemical Engineering Journal

Industrial & Engineering Chemistry Research

Fuel

Catalysis Today

Energy & Fuels

Applied Catalysis

RSC Advances

Bioenergy Research

- **Where does the biofuels group present its results?**

North American Catalysis Society Meeting

American Chemical Society National Meeting

International Conference of Environmental Catalysis

- **Where do students that work in the biofuels group go afterwards?**

Industry (e.g. Eastman, Charah, Big Ass Solutions)

Government (e.g. EPA, National Labs)

Graduate or Medical School

Academia (e.g. Utrecht University, U. Wisconsin – Madison)