Biofuel

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What role will biofuels play in solving the energy crisis?
Types of Biofuel

- Bioalcohol
- Biodiesel
- Biogas
What We Did

• Made biodiesel using soybean oil
• Calculated energy density of 3 fuels using calorimetry
The Science Behind the Fuel

Triglyceride

Transesterification reaction:

\[
\text{Triglyceride} + \text{MeOH} \xrightarrow{\text{NaOH}} \text{Fatty Acid Methyl Ester (FAME)} + \text{Glycerol}
\]
Calorimetry Data

- Reference values higher due to open system

<table>
<thead>
<tr>
<th>FUEL (MJ/kg)</th>
<th>GROUP 1</th>
<th>GROUP 2</th>
<th>GROUP 3</th>
<th>GROUP 4</th>
<th>AVERAGE</th>
<th>Reference Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiesel</td>
<td>12</td>
<td>14</td>
<td>10.5</td>
<td>10.5</td>
<td>11.8</td>
<td>37.27</td>
</tr>
<tr>
<td>Kerosene</td>
<td>8.3</td>
<td>7.3</td>
<td>12.6</td>
<td>7.9</td>
<td>9.0</td>
<td>36.8</td>
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<tr>
<td>Ethanol</td>
<td>11</td>
<td>8.1</td>
<td>16.7</td>
<td>10.7</td>
<td>11.6</td>
<td>30</td>
</tr>
</tbody>
</table>
Economics & Public Opinion

- Are biofuels economically reasonable?
  - First-generation vs. second-generation
  - Limitations and challenges

- What is the public opinion toward biofuel?
  - 67% of Americans are interested
  - Public concerns
Pros and Cons

**Food or Fuel?**

Nearly a billion people will go hungry tonight, yet this year the U.S. will turn nearly 5 billion bushels of corn into ethanol. That’s enough food to feed 412 million people for an entire year.

8 bushels of corn = 21.6 gallons of ethanol fuel

Or

Enough food to feed a person for a whole year
Laws and Regulations

  - U.S. Department of Energy
- Energy Policy Act of 2005
  - Renewable Fuel Standard
The Future of Biofuels

- Best option for clean liquid fuels
- Turn away from food crops and first-generation fuels
- An alternative to landfills
- Second-generation fuels
- Algae is promising
Algal Biodiesel

• Brief process:
  • Mechanical
  • Chemical
  • Synthesize

• About algal biodiesel:
  • 10-100% more productive
  • Increased food security
  • Can replace oil based fuels
  • Produced with waste water
Works Cited


http://biofuel.org.uk


http://energy.gov/eere/bioenergy/algal-biofuels
http://allaboutalgae.com/history/
http://ec.asm.org/content/9/4/486.short
http://futureofworking.com/7-advantages-and-disadvantages-of-algae-biofuel/

Questions?