Pyrolysis of Lignin–Novel Way of Producing Biofuels

Haoxi Ben

PROGRAM DESCRIPTION

• The development of inexpensive renewable alternatives for transportation fuels
• Lignin is the second most abundant biopolymer on Earth
With a 20 x 10⁹ annual biosynthesis rate
• Lignin is an abundant bioresource available from:
  • Currently from Chemical Pulp Mills
  • Shortly from Cellulosic Ethanol Biorefineries
• Typical kraft pulp mill utilizes about 650,000 tons of wood/year generating approximately 200,000 tons of lignin/year

TECHNICAL DETAILS

• Pyrolysis of lignin at different temperature from 300°C to 600°C
• Use different types of zeolites as catalyst
• Use NMR, GC, GC-MS, GPC and elemental analysis to analyze the pyrolysis oil

PAYOFF

• Pyrolysis oil from lignin is a potential green diesel or biogasoline bioresource
• Enhanced pyrolysis oil production
• Improved pyrolysis oil properties

KEY ACCOMPLISHMENTS

• Optimized pyrolysis conditions without catalyst: 500°C the yield is 43%
• The optimized condition of pyrolysis with zeolites as catalyst is using powder zeolites at 500°C the yield is 70%.

<table>
<thead>
<tr>
<th>Without catalyst at 500°C for different times</th>
<th>with catalyst at different temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>500°C Oil% Char%</td>
<td>Oil% Char%</td>
</tr>
<tr>
<td>60 min 43.20 54.41</td>
<td>600°C 33.21 41.87</td>
</tr>
<tr>
<td>30 min 35.79 53.03</td>
<td>500°C 1 51.17 33.68</td>
</tr>
<tr>
<td>15 min 32.57 51.91</td>
<td>500°C 2 70.32 10.20</td>
</tr>
<tr>
<td>300°C 16.68 76.49</td>
<td>400°C 32.86 46.61</td>
</tr>
</tbody>
</table>

Professor AJ Ragauskas, Supervisor