Lignocellulosic Biofuels

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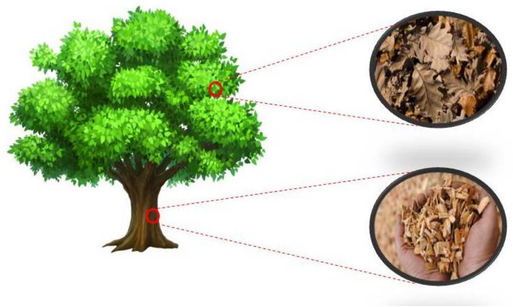
Lignocellulosic Biomass

Lignocellulosic (LC) biomass refers to plant dry residue.



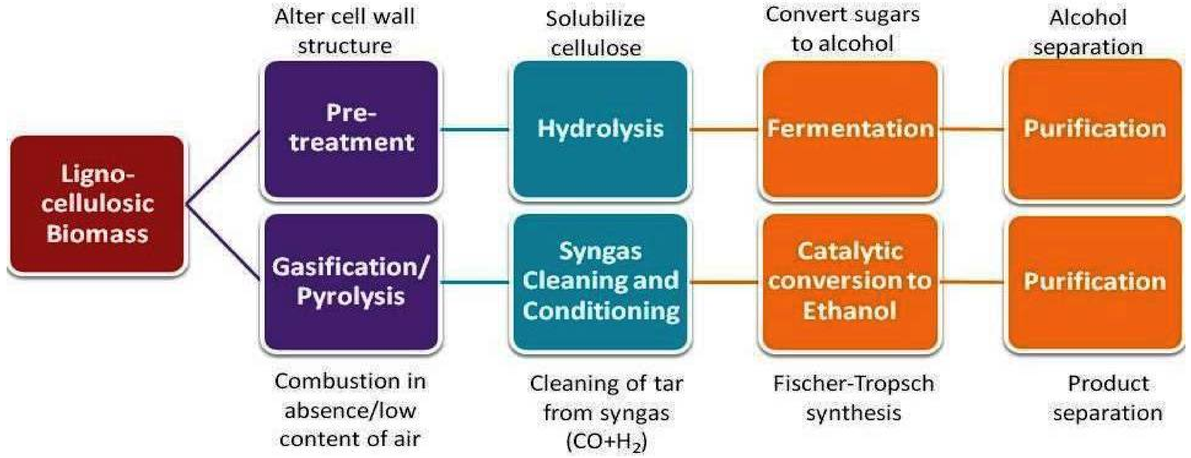
Lignocellulosic Biofuel

Fuel derived from lignocellulosic biomass.
Example: Ethanol, Butanol.

Why lignocellulosic biofuels?

1. Uses existing agricultural practises
2. Low green house gas emission
3. No competency over food crops
4. Less toxic than methanol or butanol
5. No sulphur content
6. High-octane performance at relatively low cost

Thermochemical Vs Biochemical fuel production route



Important features

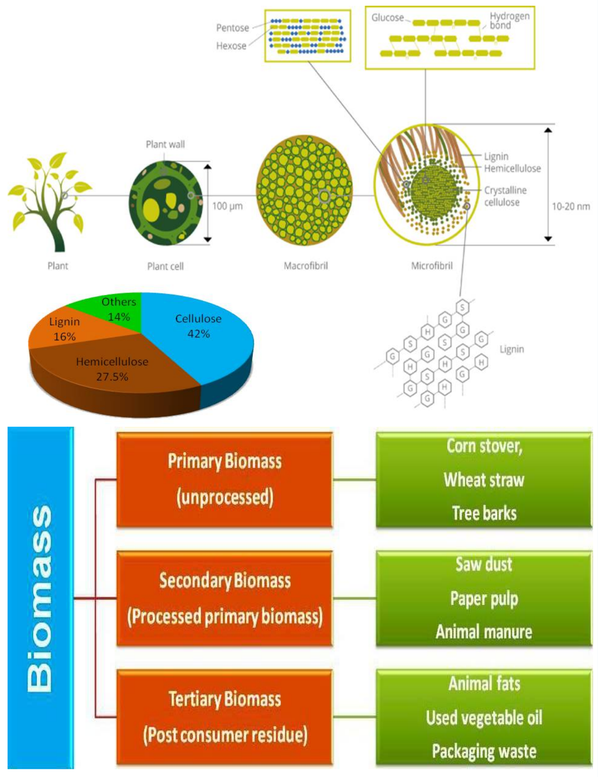
Thermochemical route

- Carbon capture and sequestration
- Can produce multiple products
- High temperature and pressure requirement
- High capital investment
- Flue gas emission

Biochemical route

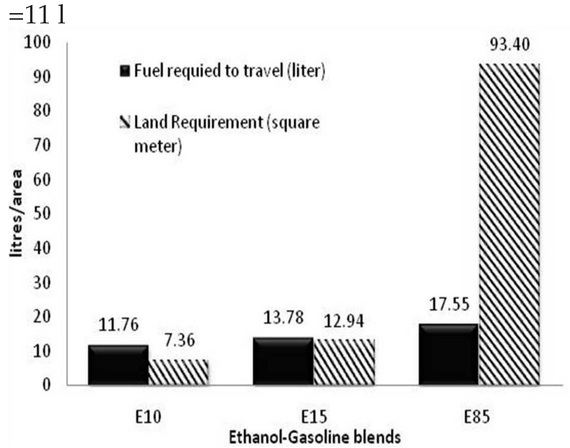
- Low temperature and atmospheric pressure
- Energy intensive size reduction
- Selection of effective pretreatment method
- High water requirement

Structure & Classification



Cost & Land requirement

Distance between Mumbai and Pune = 150 km
Petrol required to travel at a mileage of 13.5 km/l =11 l



(E10=10% Ethanol and 90% gasoline, E15=15% Ethanol and 85% gasoline, E85=85% Ethanol and 15% gasoline)

- Fuel required increases as the ethanol blend increases
- For traveling from Mumbai to Pune using E85, 93.4 m^2 of land area is required (about 60% of volleyball ground area)

Challenges & Possible Solutions

Challenges

- Biomass availability, transportation, and storage
- Seasonal and geographical variation in feedstock quality
- High land, water, and energy requirement
- High enzyme and process cost

Possible solutions

- Use of dedicated energy crops
- Process development and improvement for pretreatment and hydrolysis
- Screening of microbes producing more enzyme or enhance enzyme productivity by genetic manipulation

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Research Scope

- Influence of parameters like particle size, moisture content, and ash content over pretreatment
- Selection of effective and economical pretreatment method
- Optimization of acid pretreatment and enzymatic hydrolysis

References

1. Foust, T.D.; Aden, A.; Dutta, A.; Phillips,S. An economic and environmental comparision of a biochemical and thermochemical lignocellulosic ethanol conversion processes.Cellulose. 2009. 16, 547-565.

2. Arora, D.S.; Busche, S.; Cowlin, S.; Engelmeier, T.; Jaritz, H.; Milbrandt, A.; Wang, S. Indian Renewable Energy Status Report: Background report for DIREC 2010.National Renewable Energy Laboratory (NREL). NREL/TP-6A20-48948.