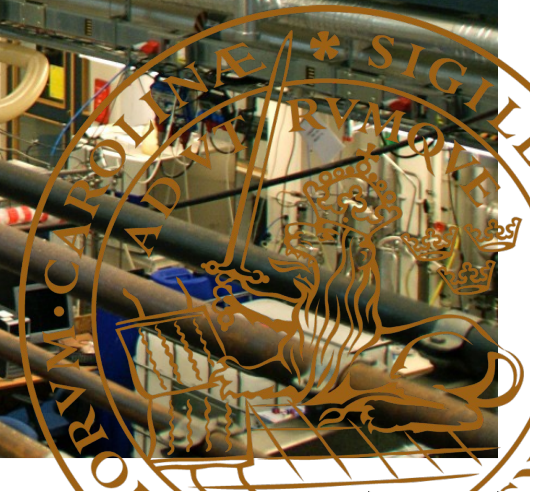




Biomass to (turbine)fuel

OLA WALLBERG



Our Research



- Green Chemical Engineering
 - Advanced biofuels
 - » Bioethanol
 - » Biogas
 - » Jet-fuel
 - » Lignin derived drop-in fuel
 - Materials
 - » Hemicellulose films and gels
 - » CO₂ as feedstock (CCU)
 - » Lignin derived products

Our Research



- Sustainable process technology
 - Separation processes
 - » Electrification through membrane processes
 - » Process design and integration
 - Smart pharma factories
 - Process technology
 - » Catalysis

Our Research



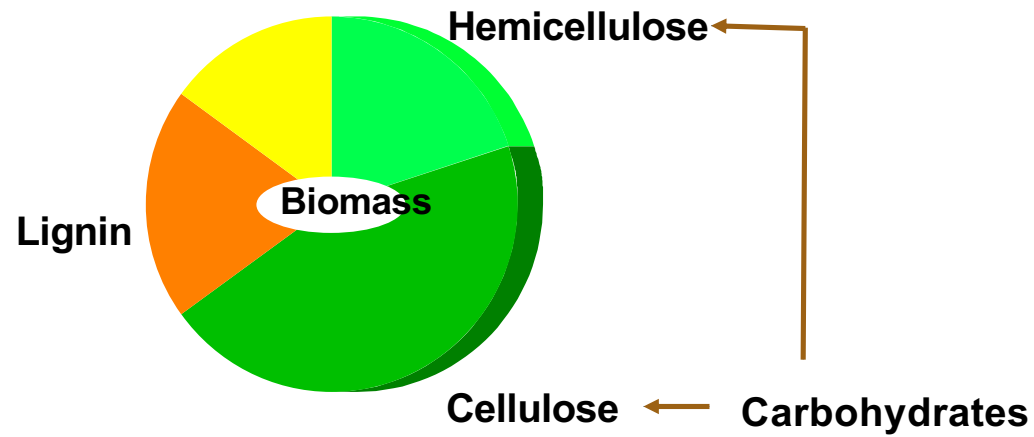
- Environmental technology
 - CCS
 - » Precipitating amine system
 - Micropollutants in waste waters

Vad vill ni ha för bränsle?

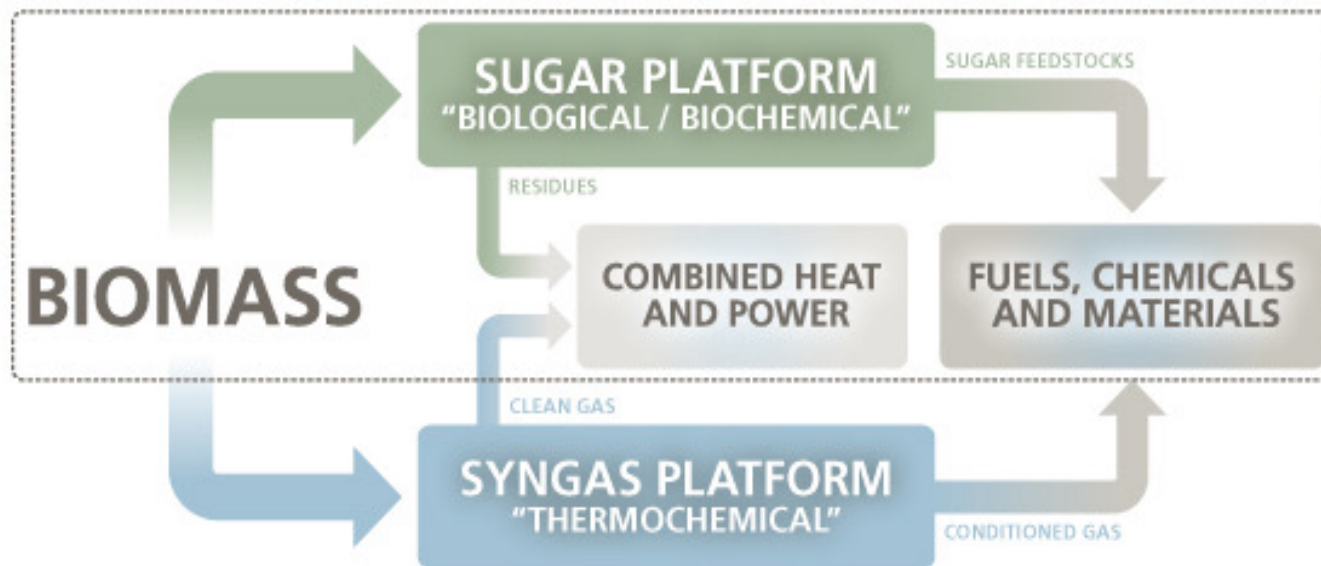


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Biomass is more complex the fossil resources



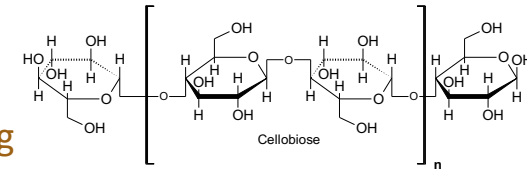
BIOREFINERY CONCEPTS



Main constituents of lignocellulosics

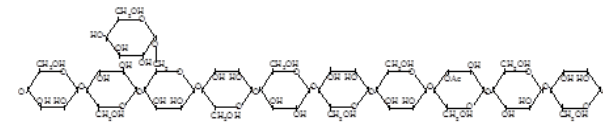
- **Cellulose**

- Polymer with cellobiose as repeating unit
- Insoluble in water and dilute acid, but water-absorbing
- Alkali causes swelling and some dissolution



- **Hemicellulose**

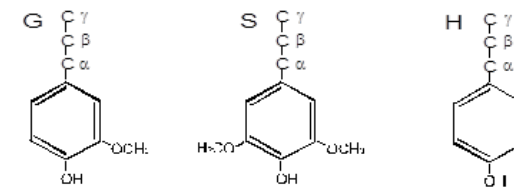
- Collective term for polysaccharides such as arabino-xylans, glucomannans etc.
- Frequently contains acetyl groups
- No crystalline structure
- Insoluble in water at low temperatures



O-acetyl-galactoglucomannan

- **Lignin**

- VERY complex, branched polymer
- Main building blocks are phenylpropane units
- Important for the cells' properties:
 - Rigidity
 - Important for transport channels



G:Guaiacyl

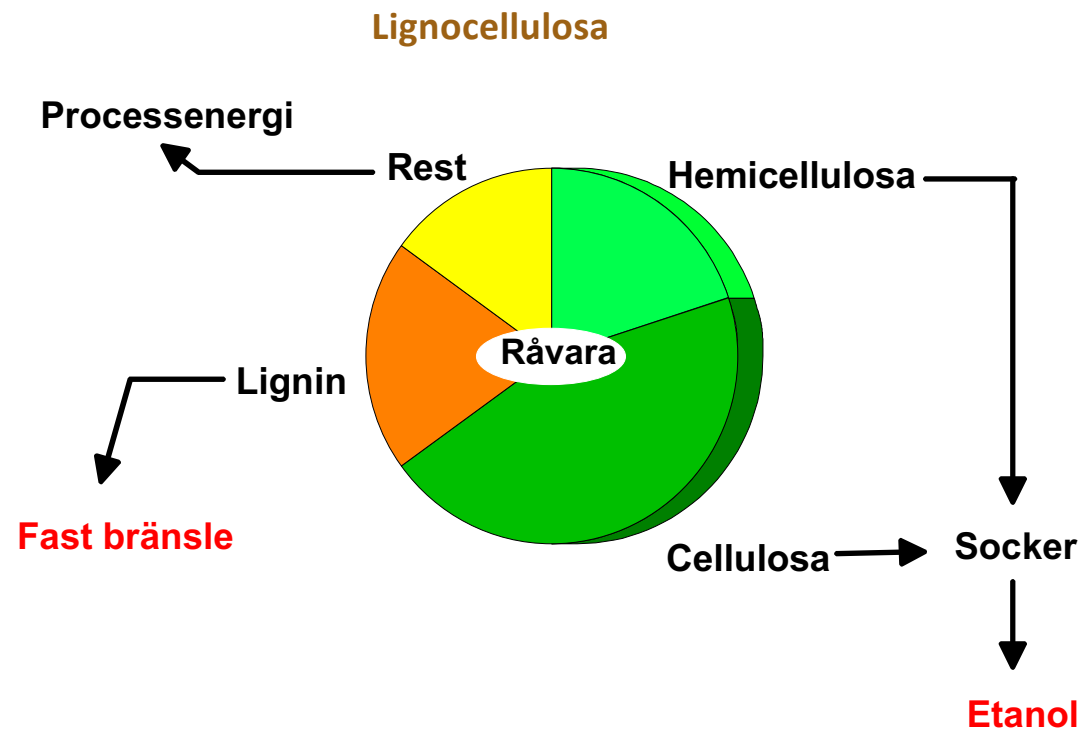
S: Syringyl

H: p-hydroxyphenylpropane

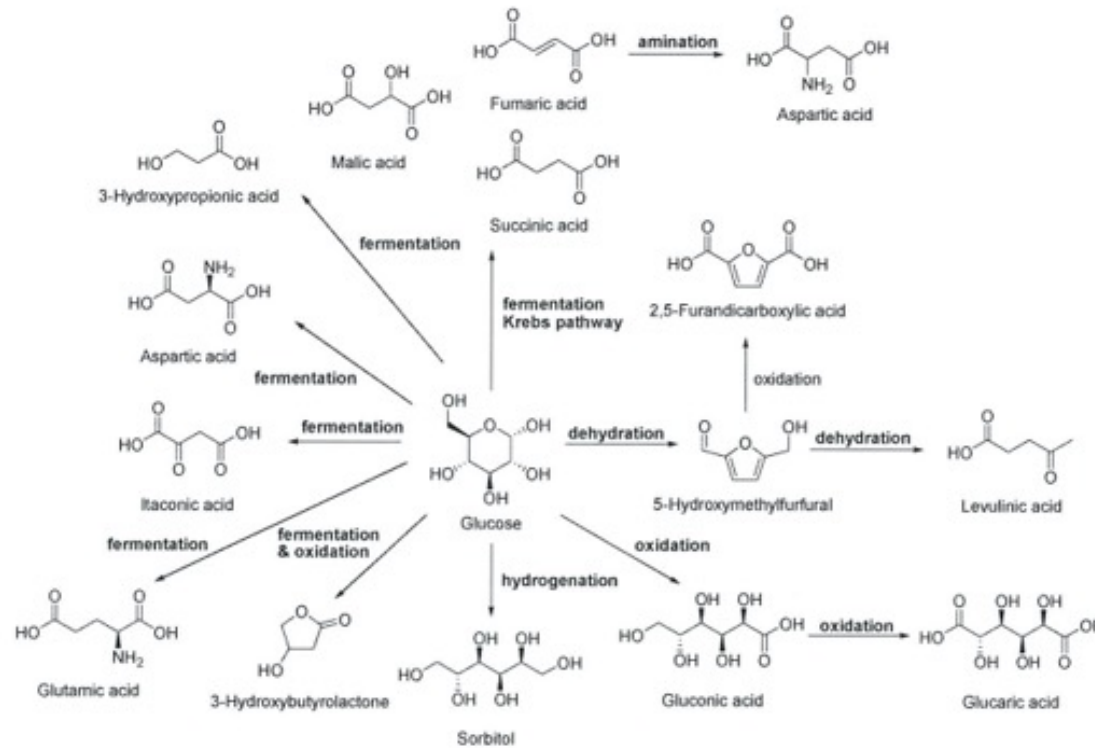


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AIM, Use entire plant



The famous DOE top "twelve" - likely "new" platform chemicals



Andric, P. (2010). *Reactor design for improved enzymatic hydrolysis of lignocellulose.*
PhD thesis, DTU

Possible fuels from biomass

liquid

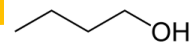
- *Metanol*



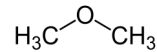
- *Etanol*



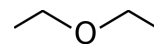
- *Butanol*



- *Dimetyleter*

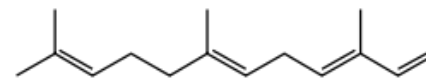


- *Dietyleter*



- *"Syntetisk diesel"*

- *"Biodiesel" (FAME, HVO)*



Gas

- *Metan* CH4

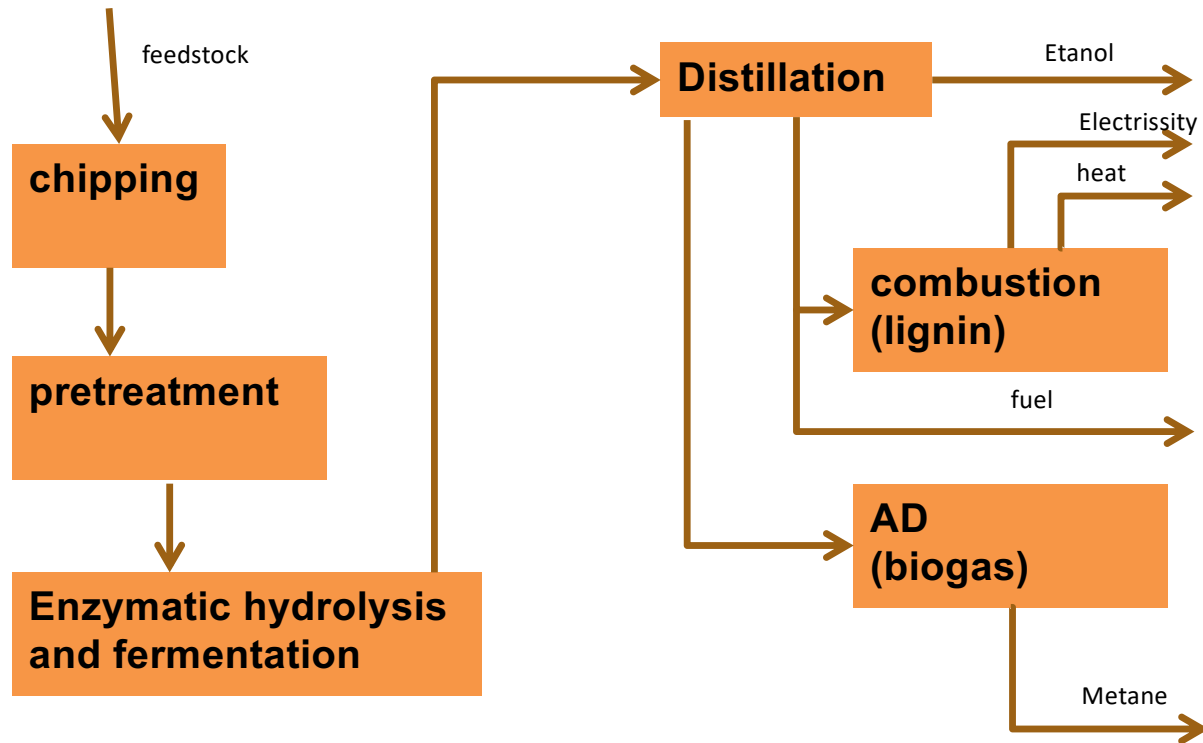
- *Vätgas* H2

- *"Hytan" (blandning av väte och metan)*

Farnesene (Amyris technol)



We need a process





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