Hydrothermal pretreatment of sugar beet residues targeting sugars production

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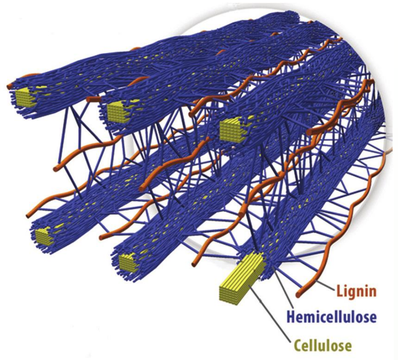
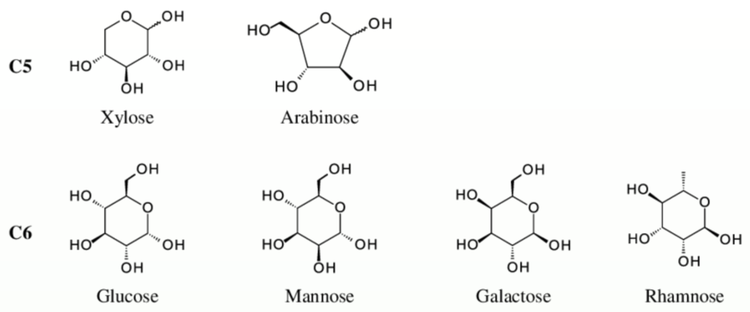
Introduction



HYDROLYSIS



- Hydrothermal pretreatment: low-cost and eco-friendly method to produce sugars from biomass
- Utilization of hot water properties → polysaccharides degradation to oligo and mono-saccharides

Objectives

- **Conversion:**

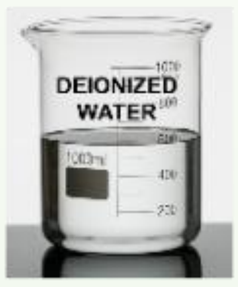
  Sugar beet residues → Sugars production
- **Main parameters investigation:**
  - Temperature
  - Residence Time
- **Comparison:**

  Hydrothermal – **Acid** Pretreatment

Methodology

SUGAR BEET RESIDUES

SOLVENT



- Temperature: 110º – 160º C
- Reaction Time: 15 – 30 min
- Solid – Liquid Ratio: 1 / 10
- Compression gas: N_2 20 bar

TREATMENT

1. Filtration of products
2. Aqueous phase removal
3. Solid residue drying
4. Products analysis

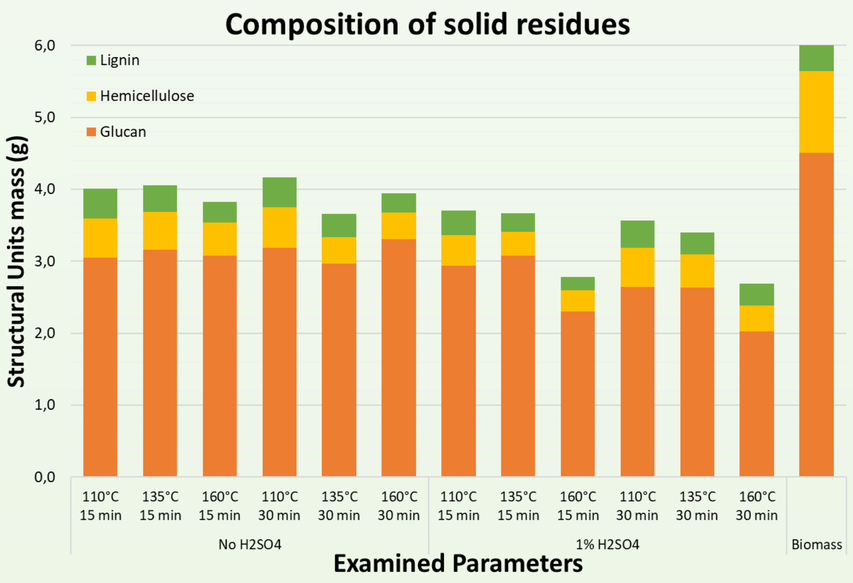
PRODUCTS

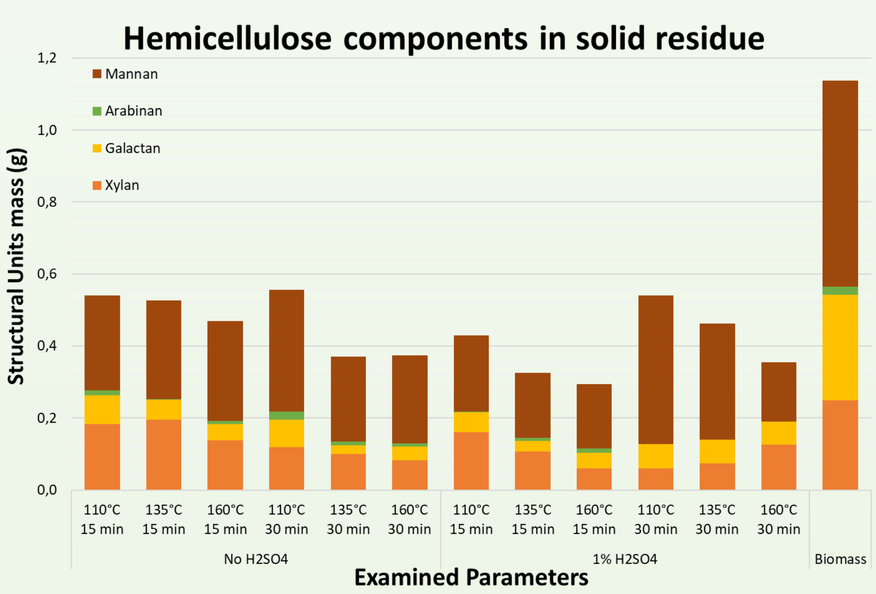
- Gas products

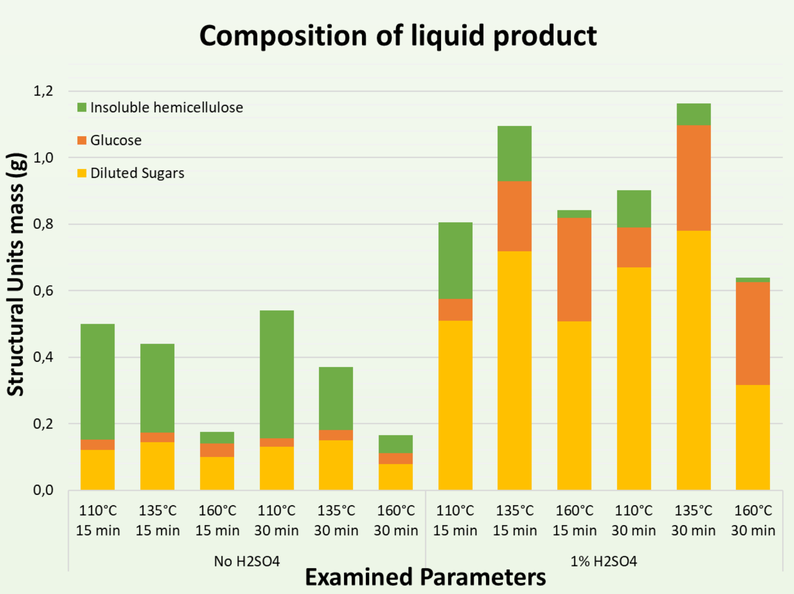
- Aqueous phase

- Solid residue

Results & Discussion







Pretreatment effect in solids:

- **Large reduction** of cellulose and hemicellulose content in solids (>50 wt%)
- Lignin content high in solids (**desirable** - it can lead to enzymes inhibition)
- Intense conditions lead to **higher liquefaction:**
  1) Arabinan and galactan high dilution
  2) Mannan – xylan lower liquefaction (higher in acid treatment)

Pretreatment effect in liquid products:

- Hydrothermal: Poor sugars yield (max at 135 ºC and 30 min)
- Acid: Significantly higher sugars yield
- At high temperature:

  Xylose is further converted to furfurals – enzyme **inhibitors**

Conclusions

1) Sugar beet pretreatment leads to sugar production for enzyme nutrients
2) Acid pretreatment **favorable** in terms of sugars production
3) Optimal temperature and time: **135 ºC** and **30 min** (max. 1.1g sugars)

Acknowledgement

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