

Pretreatment of lignocellulose: Effects of the redox environment

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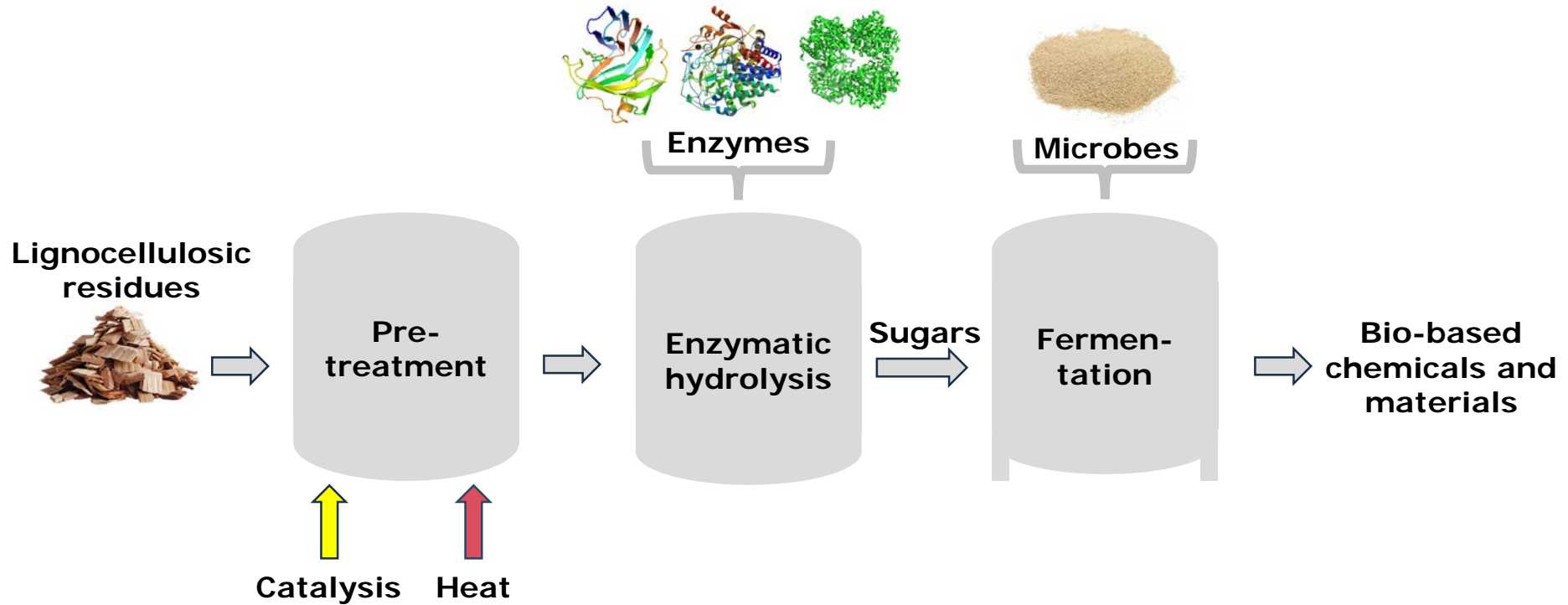
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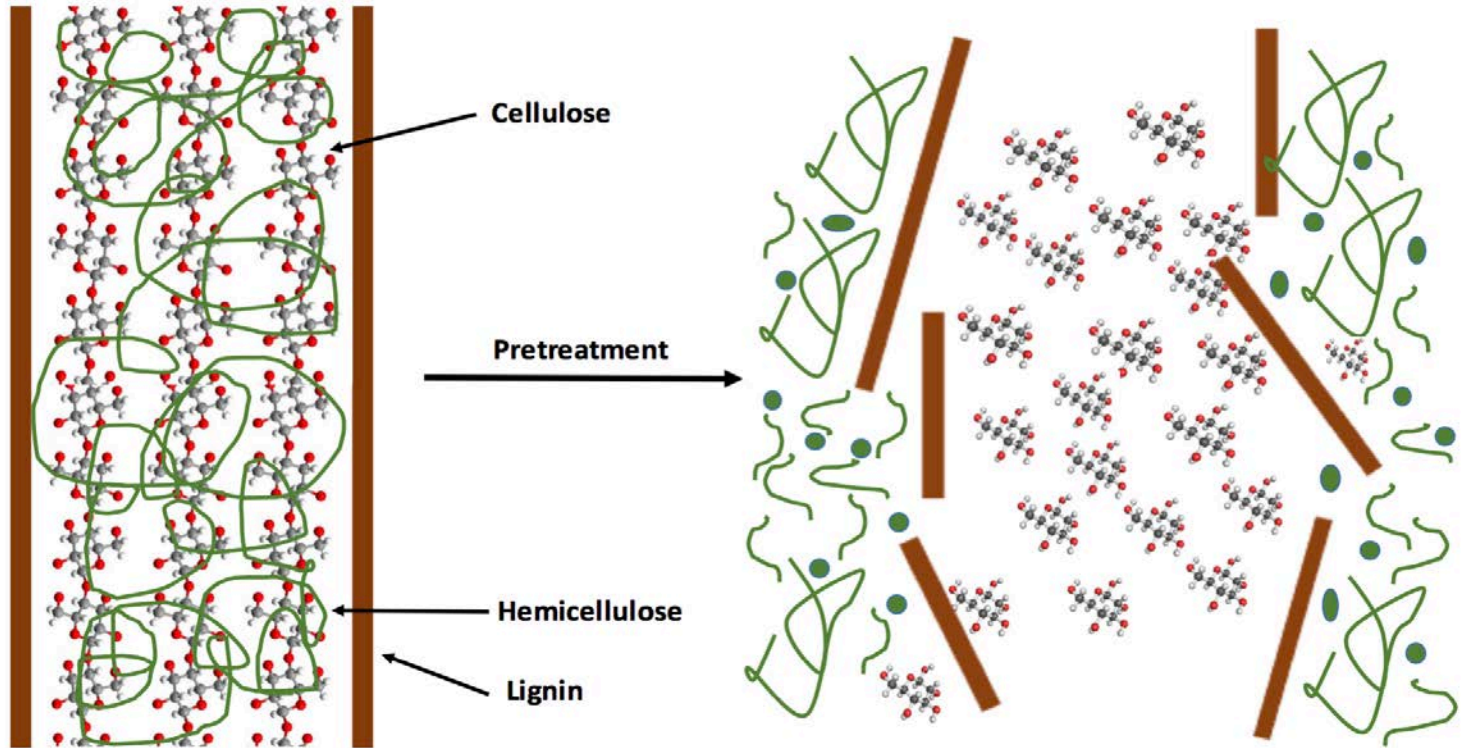
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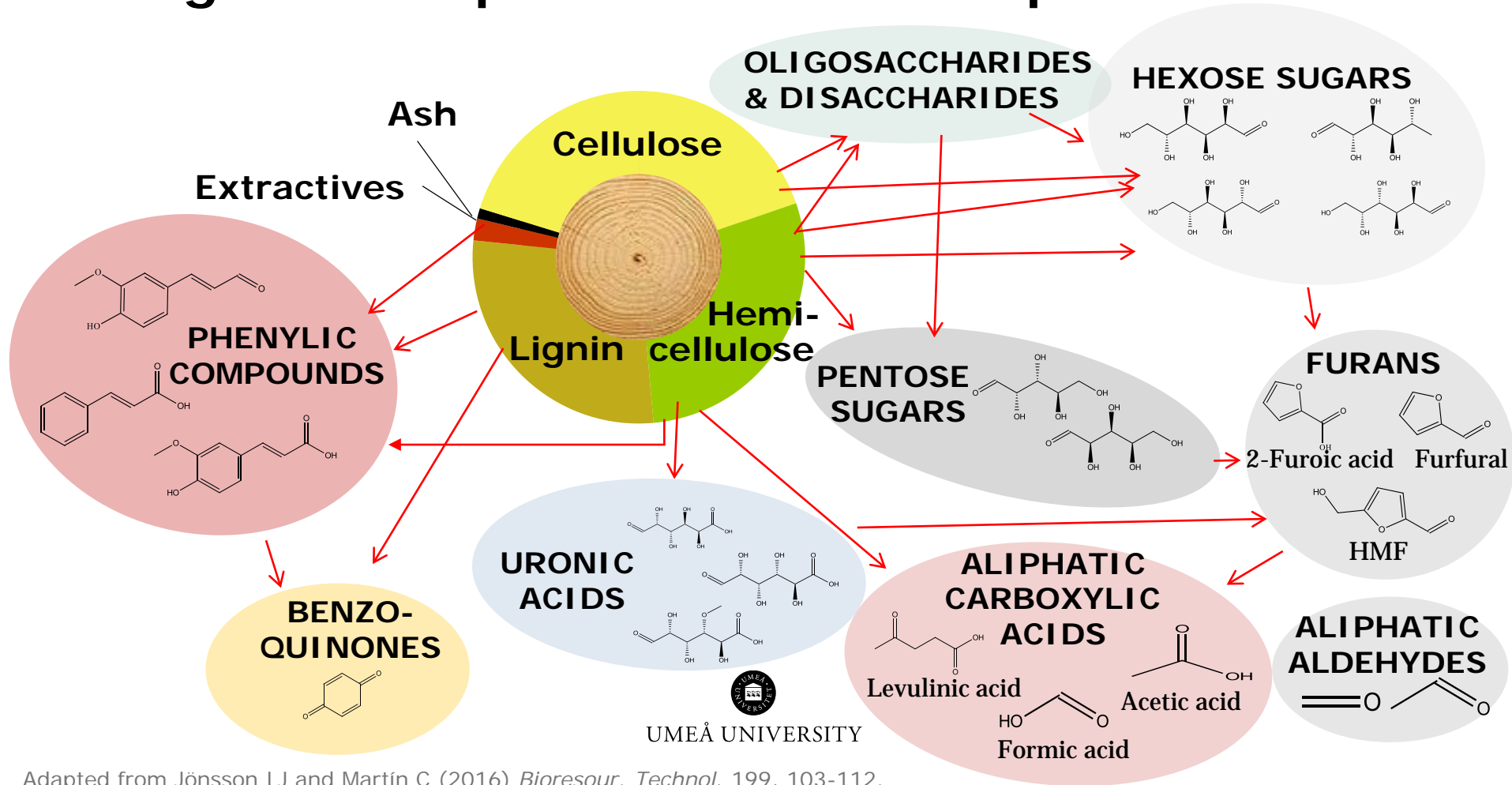
Biochemical conversion of lignocellulose



Pretreatment - Why is it important?

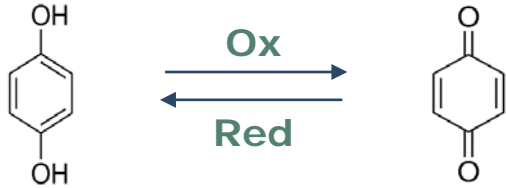


Degradation products from acid pretreatment

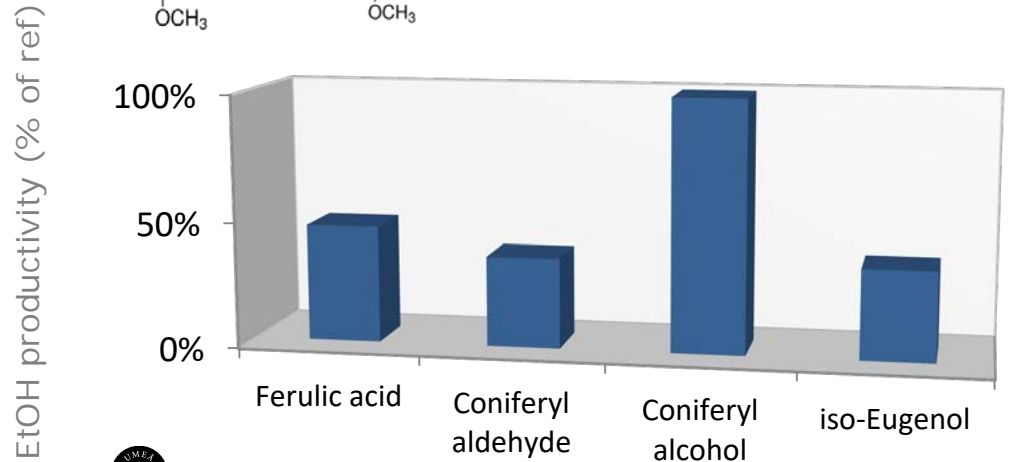
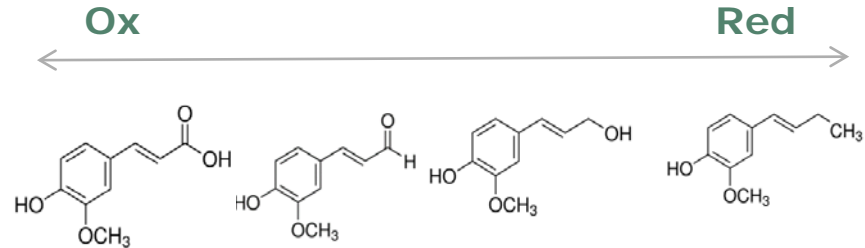
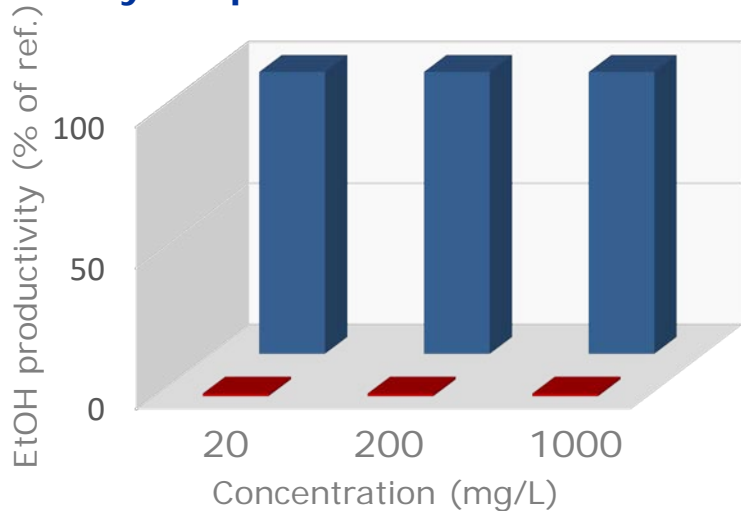


Significance of oxidation and reduction

Inhibitory effects of lignin degradation products on yeast - examples



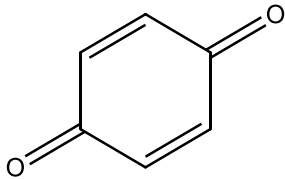
Hydroquinone *p*-Benzoquinone



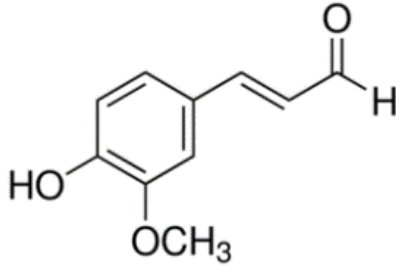
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Pretreatment by-products inhibiting the action of microorganisms

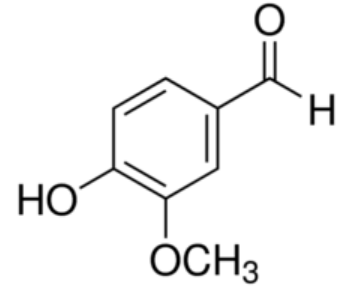
Benzoquinones



Coniferyl aldehyde



Vanillin



Thousand times lower concentration – Thousand times more inhibitory



Hypothesis and goals

Hypothesis

Presence of O₂ during pretreatment will affect inhibitor formation

Goals

Determine how presence of O₂ affects:

1. Yield and composition of pretreated solid
2. Concentration of inhibitors in pretreatment liquid
3. Enzymatic digestibility of pretreated solids



Raw Materials

- **Most abundant tree species** in Swedish forests
- Low contents of **inorganic constituents**
- High yields of easily converted **hexose sugars**

Norway spruce



- One of the **most abundant agricultural residues**
- **Great potential** for biofuels and cellulosic biorefinery industries

Sugarcane bagasse



Results - Conclusions

- Yield of pretreated solids was affected with O₂
- Presence of O₂ generally led to formation of more microbial inhibitors
- **Presence of O₂ has large impact on yields**



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Thank you for your attention

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