Nanostructural changes within the cell wall during processing

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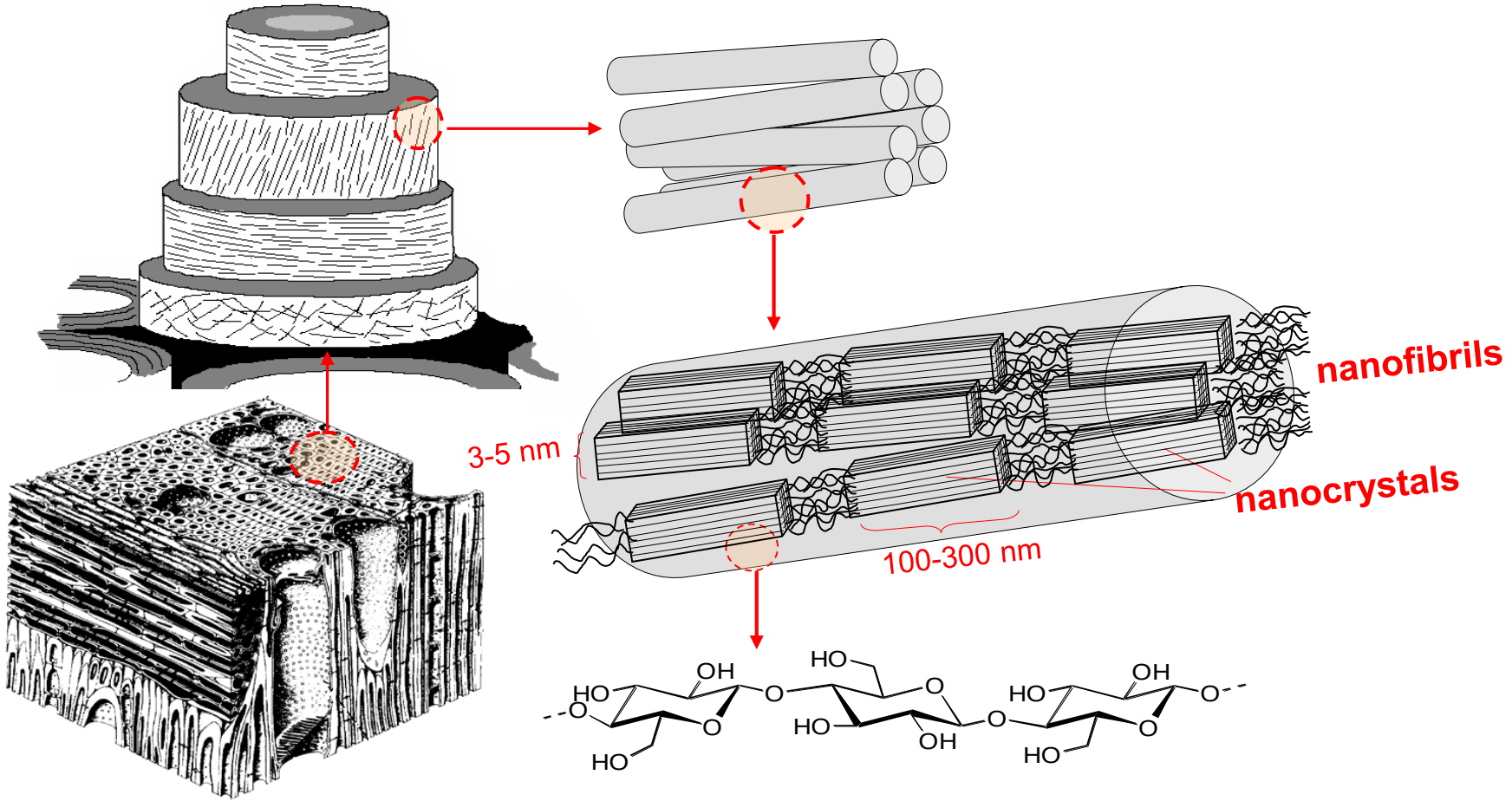
nanofibrils
3-5 nm
nanocrystals
100-300 nm
HO
OH
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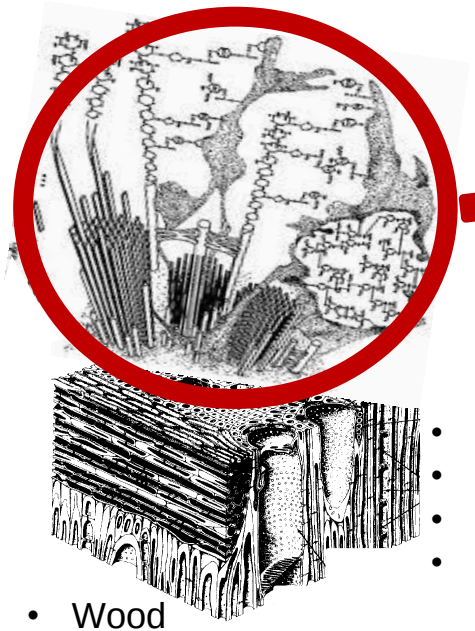
HO



- Wood
- Bark
- Branches
- Waste fibers

PRETREATMENTS

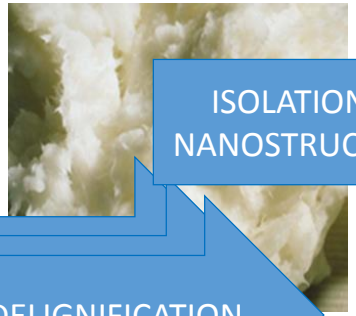
- Mild steam explosion
- Hot water extraction
- Enzymatic pretreatments
- Organosolv methods

hemicelluloses

LCCs

extractives

lignin structures



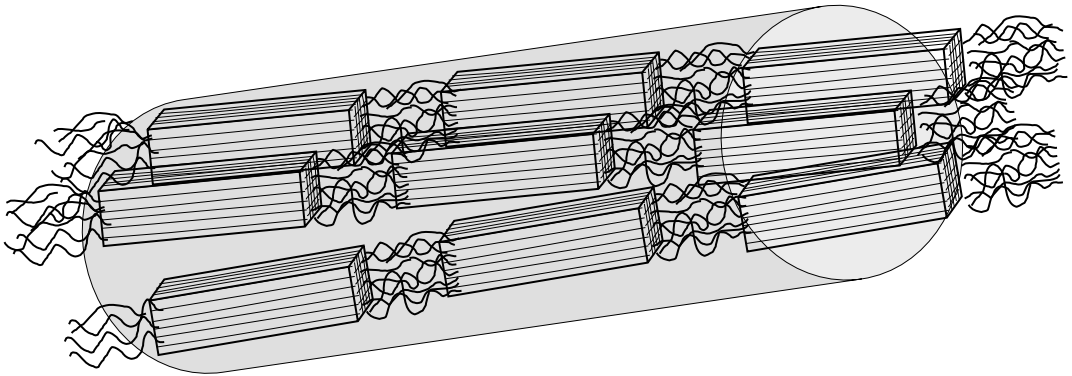
ISOLATION OF NANOSTRUCTURES

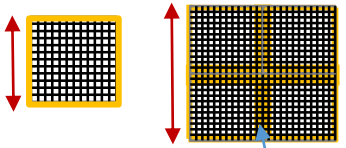
CELLULOSE NANOCRYSTALS NANOFIBRILS

DELIGNIFICATION

- Traditional methods
- Soda cooking
- PAA –delignification
- Chlorit-delignification
- Organosolv methods

Correlation to morphological changes?





Impact on the surrounding wood matrix?

Inaccessible fibril area

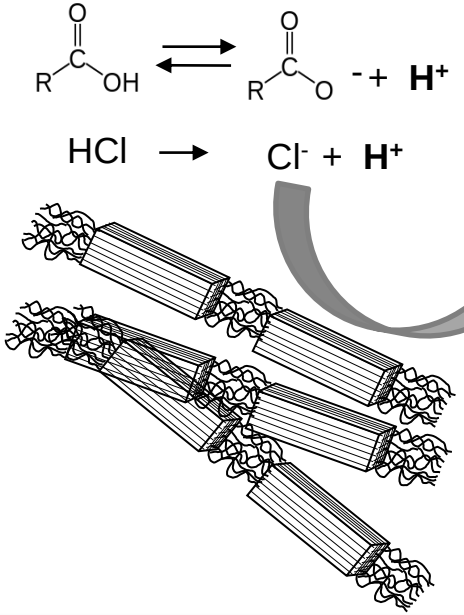
Correlation to changes in molecular and chemical composition?

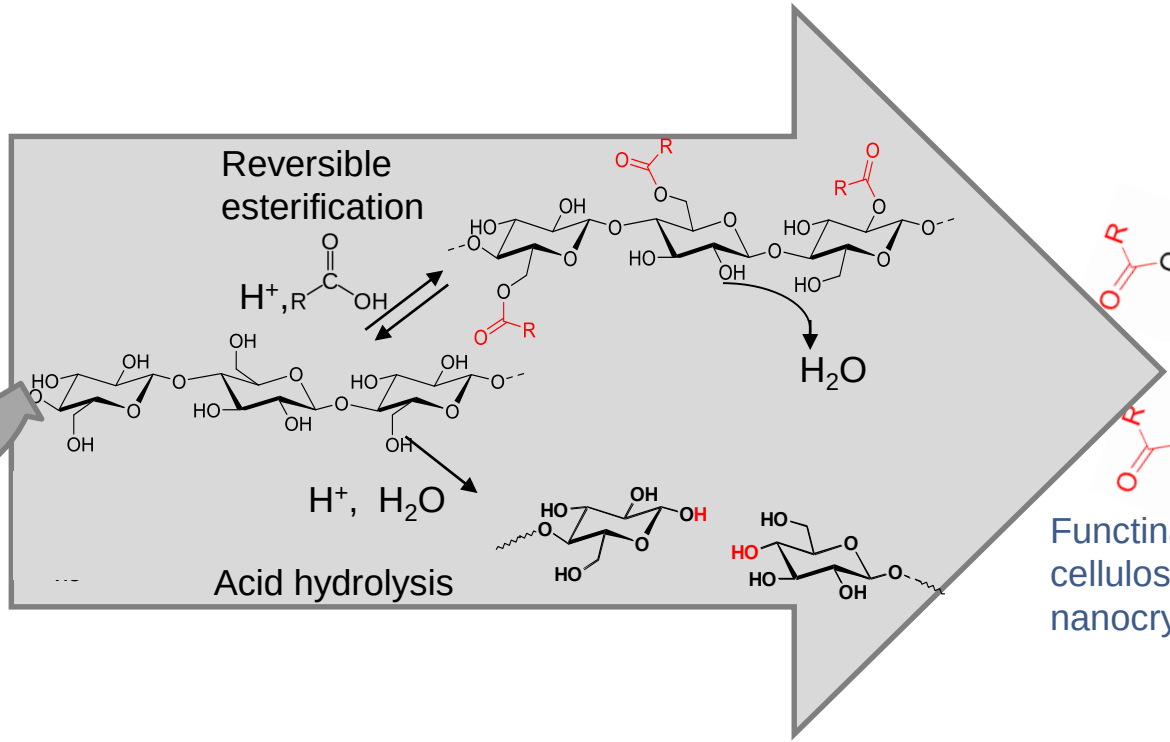
How are cellulose nanostructures affected during hydrothermal pretreatments and delignification processes?

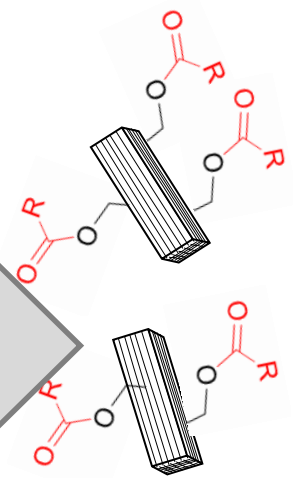
- Changes in individual crystals and nanofibrils
- Aggregation processes
- Impact of the nanostructural changes on the surrounding wood matrix
- Correlation to changes on molecular level
- Correlation to morphological changes

Performing isolation and functionalisation of cellulose nanocrystals in one step: Fischer esterification

Functionalizing organic acid
+ catalyzing strong acid:



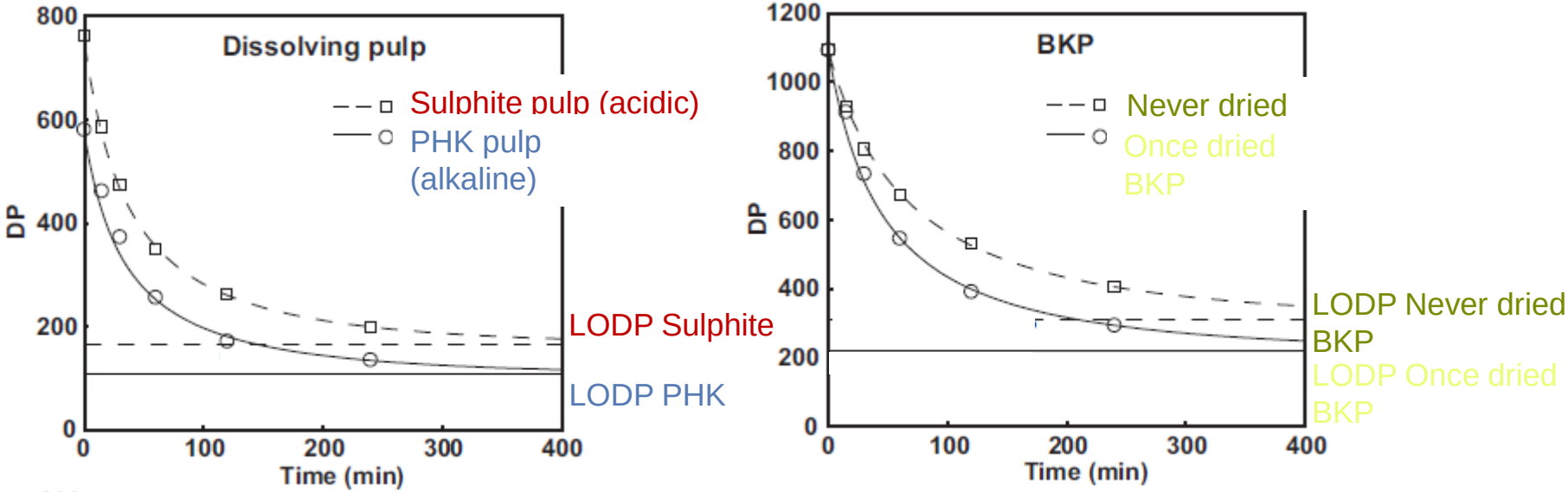




Functinalized
cellulose
nanocrystals

Some more results…

Hydrolysability (recovery of the nanocrystals) as a function of pulping conditions:



Palme et al., **2016**, *Carb Polym* 136, 1281-1287