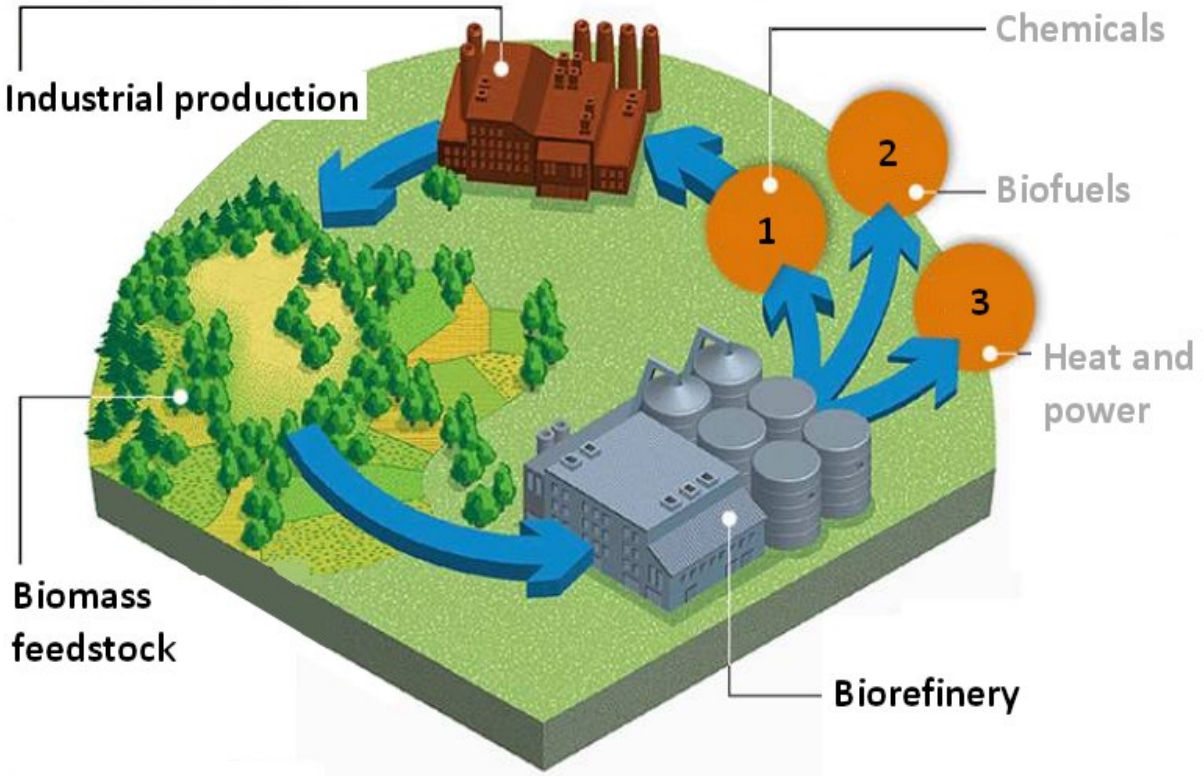
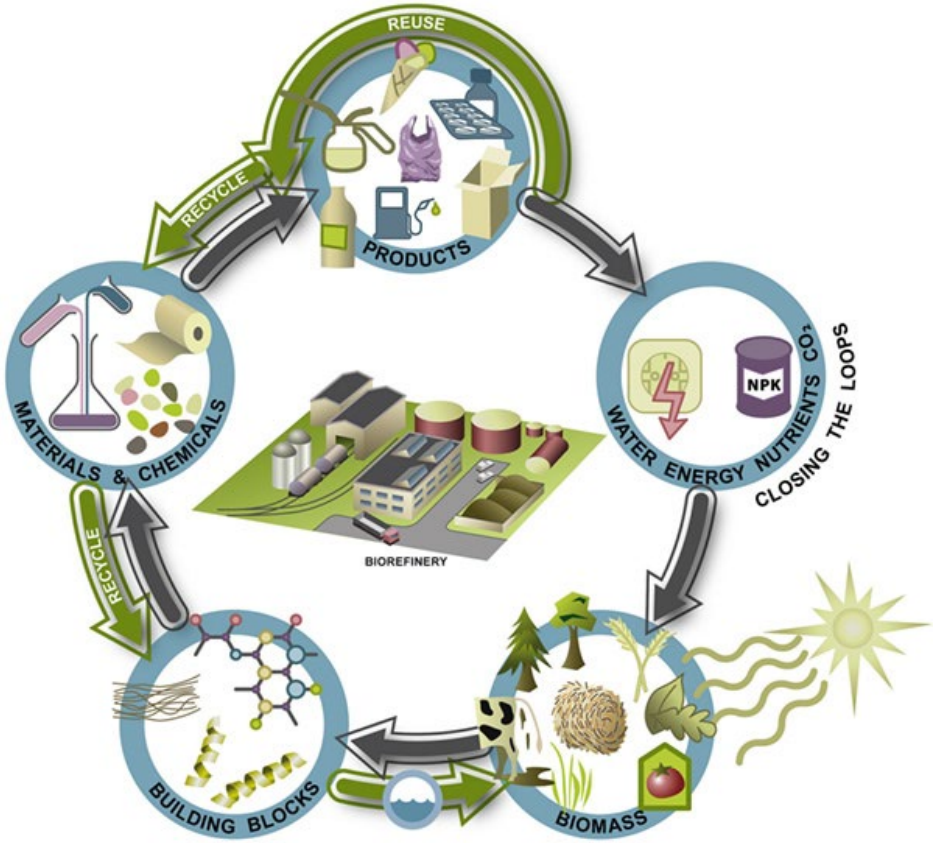
Department of Earth and Environmental Sciences
DISAT

VALICELL LAB
(Valorisation of LignoCellulosic Labs)

- Prof. Marco Orlandi, PO
  CHIM/01, Analitycal Chemistry
- Prof. Luca Zoia, PA
  CHIM/06, Organic Chemistry luca.zoia@unimib.it
- Prof. Heiko Lange, PA
  CHIM/03, Inorganic Chemistry heiko.lange@unimib.it

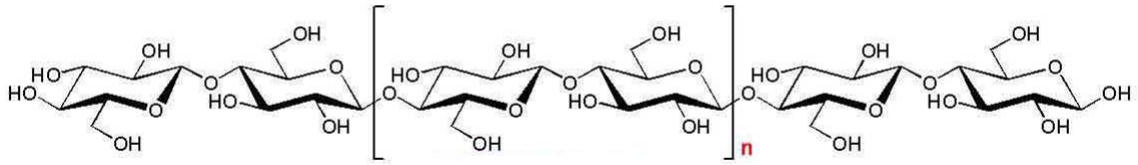
Bio-based and Circular Economy



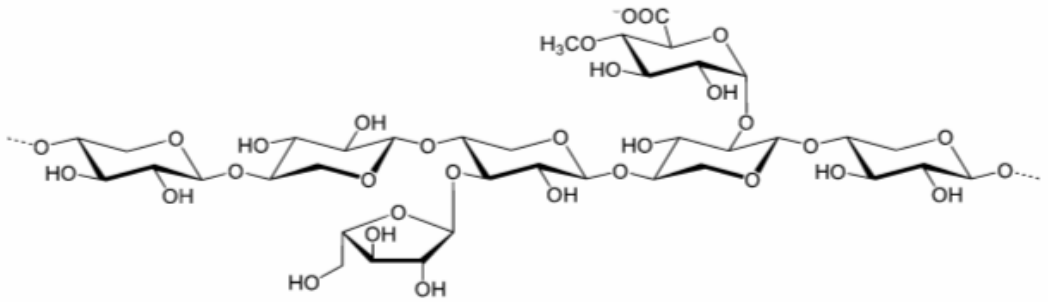


Lignocellulosic materials

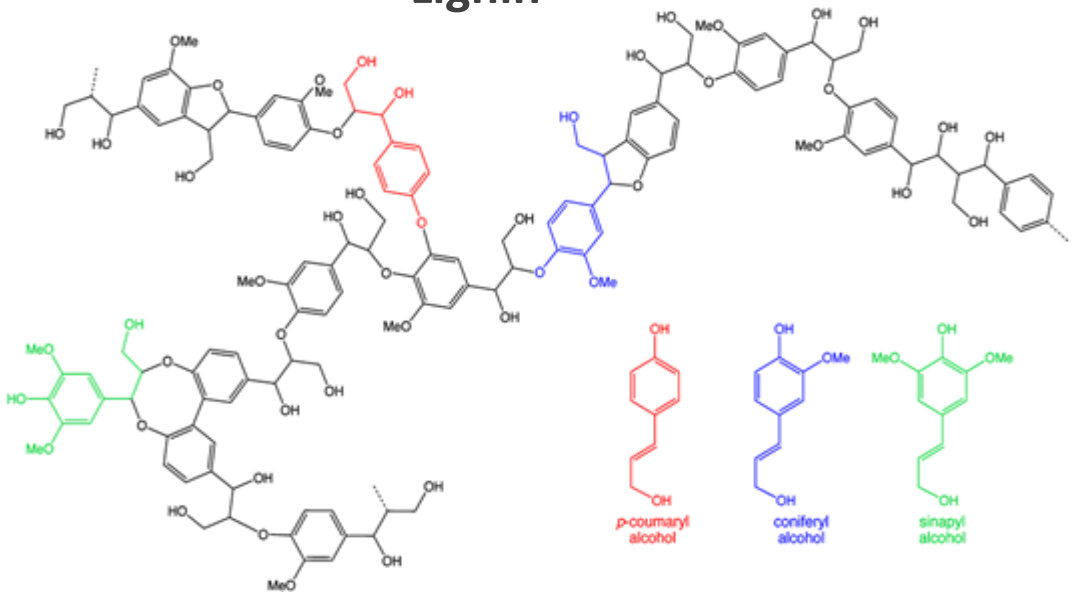
Cellulose



Hemicelluloses



Lignin



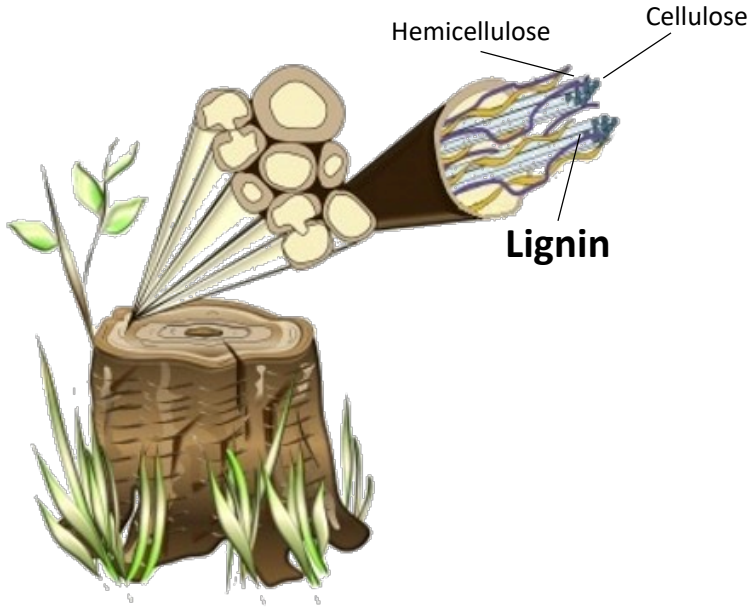
Others

Terpenes, lignans, fats, waxes, fatty acids, alcohols, ***tannins, suberin*** *ecc..*

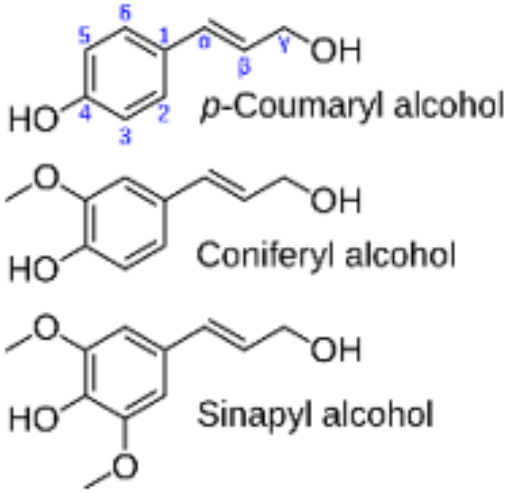
Ashes

SiO_2 Al_2O_3 Fe_2O_3 CaO Na_2O
K_2O MnO TiO_2 MgO P_2O_5

Lignin: a bio-based material

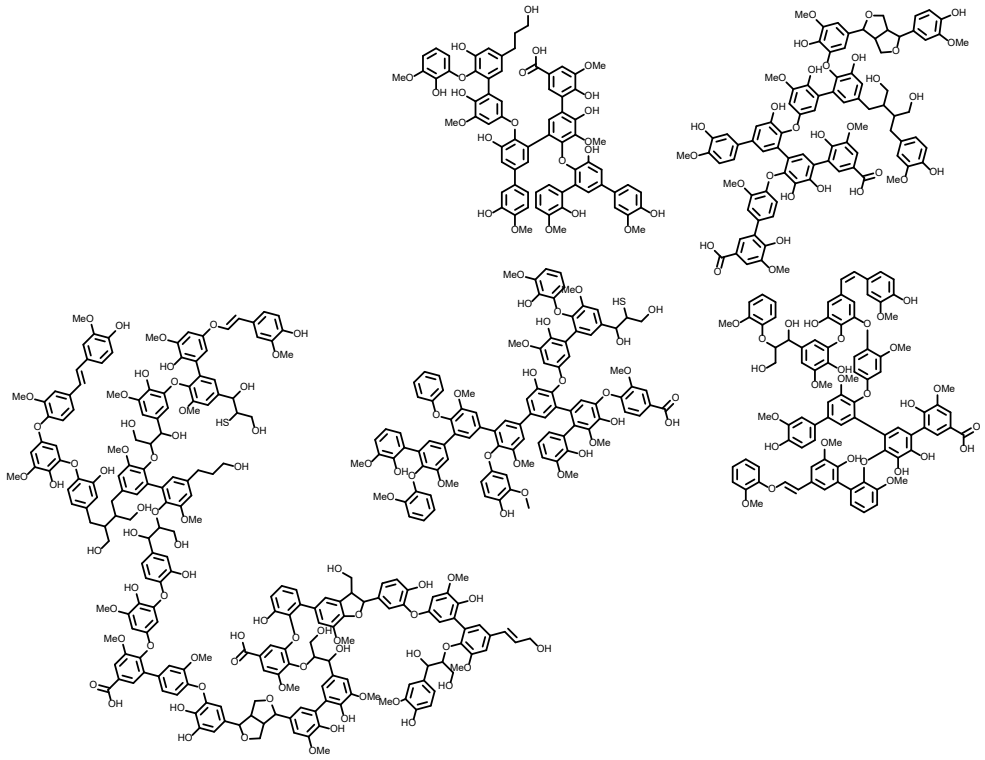


3 precursors: monolignols



Many different functionalities based on:

- Botanic origin
- Extraction process



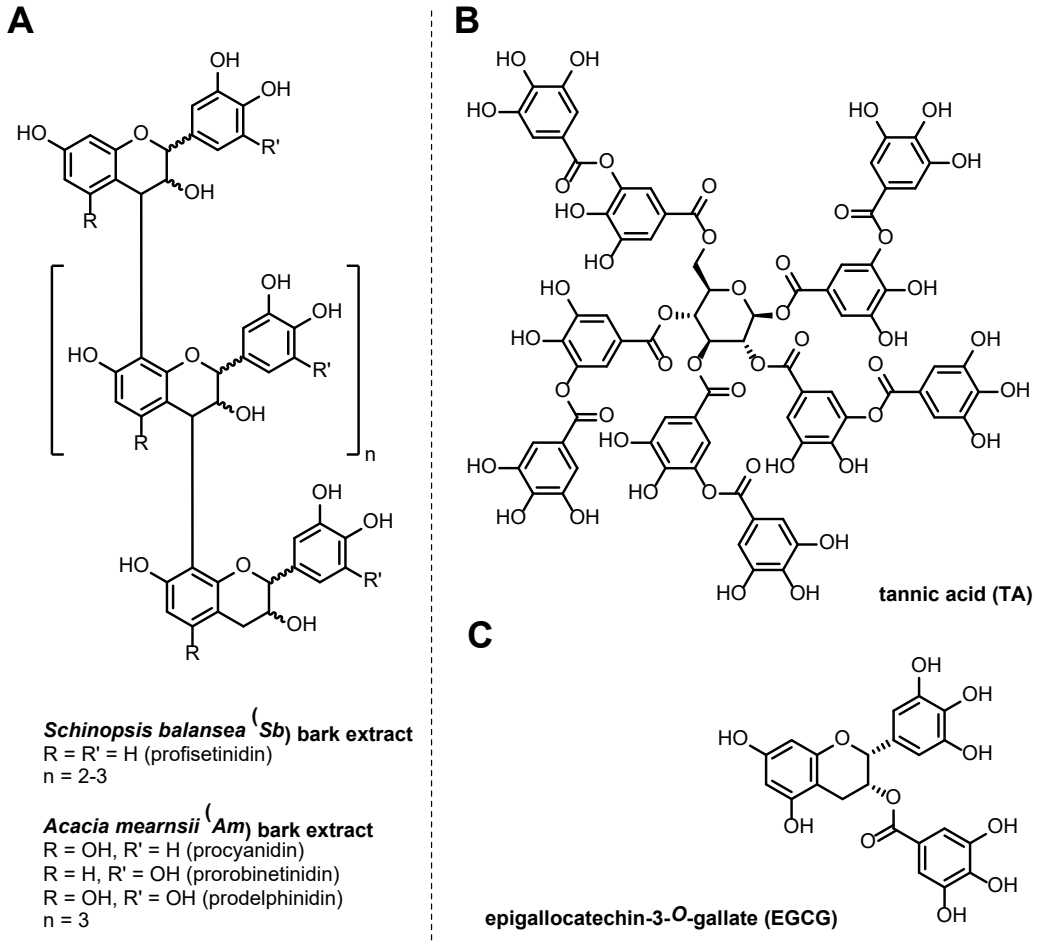
Softwood Kraft Lignin

- Most abundant aromatic bio-polymer
  - Anti-oxidant properties
- Paper industry and biorefinery by-product

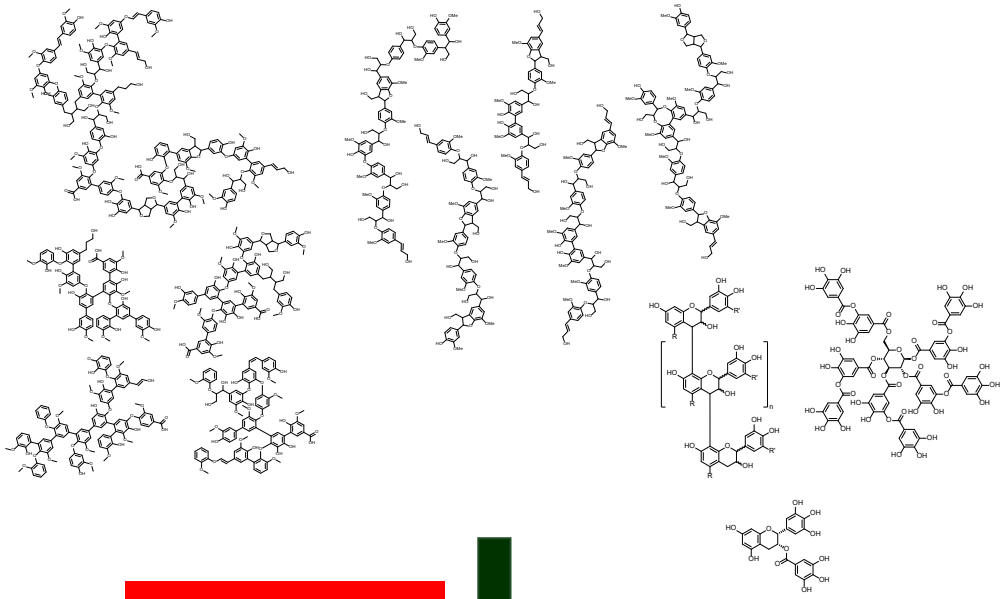
- Complex chemical structure
  - Dark brown and odorous

Tannins: different natural polyphenols

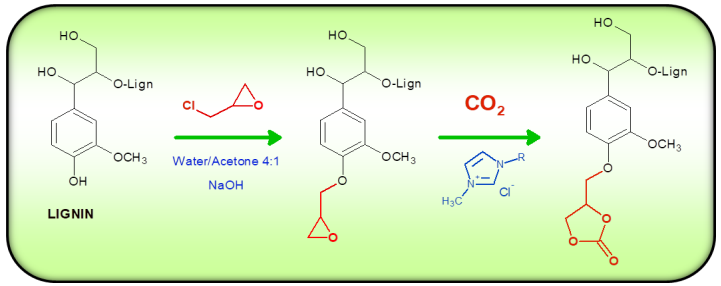
- Most abundant aromatic bio-polymer
  - Anti-oxidant properties
  - antimicrobial properties
  - less random structural features
- higher costs than in case of lignin



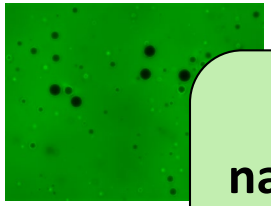
On going projects

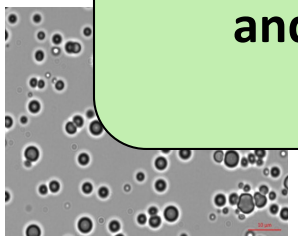


robust / green chemistry



ultrasound





tannin-based micro- and nanocapsules for agricultural and pharmaceutical applications

scalable solvent-antisolvent technique

polyphenol-based nanoparticles with tuneable stability and surface characteristics