Department of Catalysis and Chemical Reaction Engineering

NATIONAL INSTITUTE OF CHEMISTRY SLOVENIA

PRETREATMENTS, FRACTIONATION AND UPGRADING OF LIGNOCELLULOSIC BIOMASS TO THE PLATFORM AND VALUE-ADDED CHEMICALS

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Ligno(Hemi)Cellulosic Biomass

H_2O → **Extraction** → Liquid → Extractives; Solid → **HCL**

$H_2O/EtOH$, H_2SO_4, T = 180 – 230 °C → **Organosolv pulping** → Solid → Cellulose; Liquid → **HL**

Precipitation → Liquid → Hemicellulose; Solid → Lignin

Extractives

Ref: (1 – 3)

PRE-TREATMENT → ISOLATION → PURIFICATION → Value-added compounds

PRE-TREATMENT
- Cutting
- Milling
- Vacuum drying
- Lyophilisation
- Steam/CO_2 explosion

ISOLATION

Classic extraction methods:
- Water extraction
- Organic solvent extraction
- Acid treatment

Green extraction:
- Supercritical extraction
- DES extraction

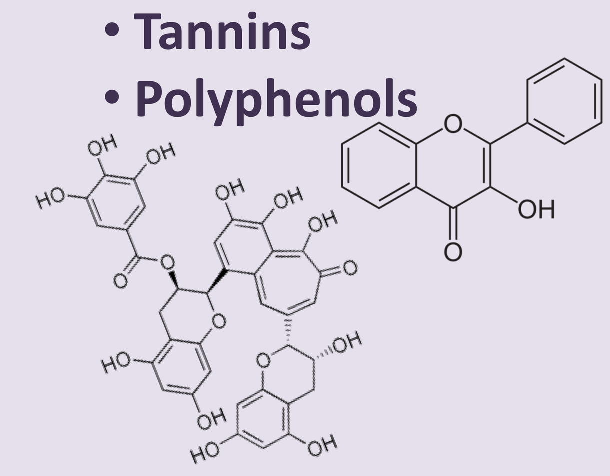
Physical-mechanical assistance:
- Ultrasound
- Microwave
- Electroporation

PURIFICATION
- Antisolvent precipitation
- Re-extraction
- Chromatography
- Filtration
- Centrifugation
- Distillation

Commercialized Industrial scale

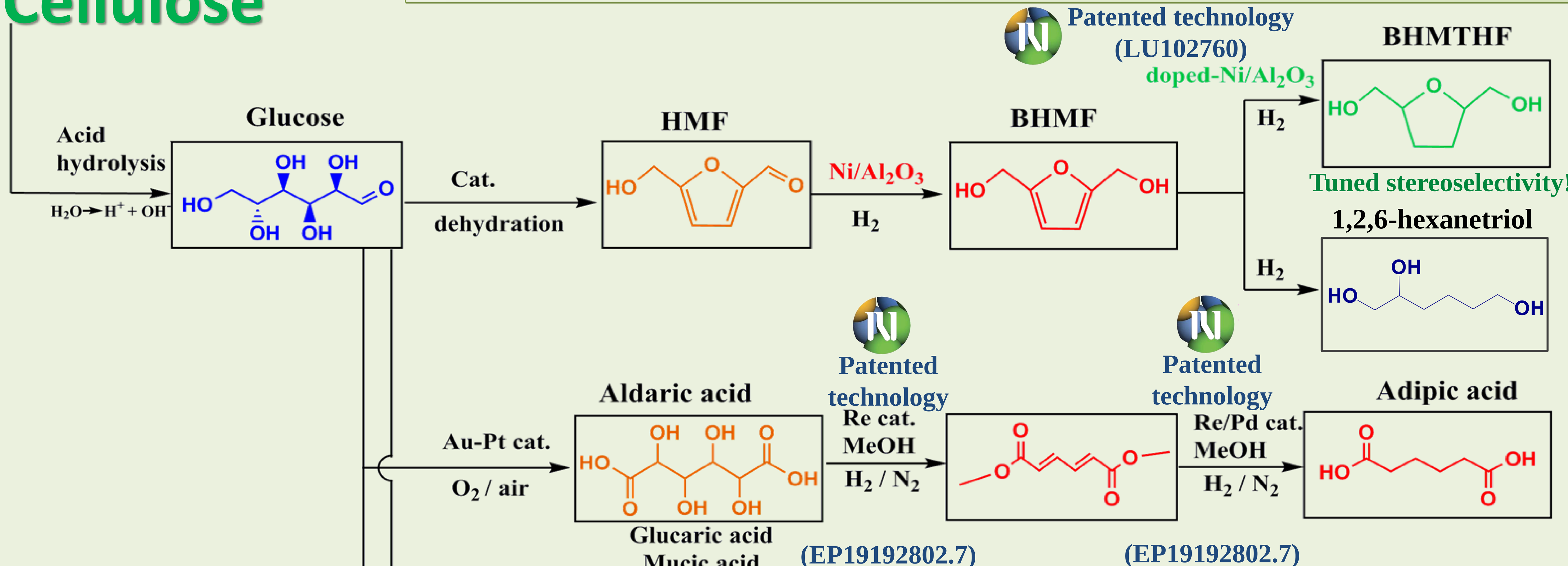
Flavonoids from bark of silver fir

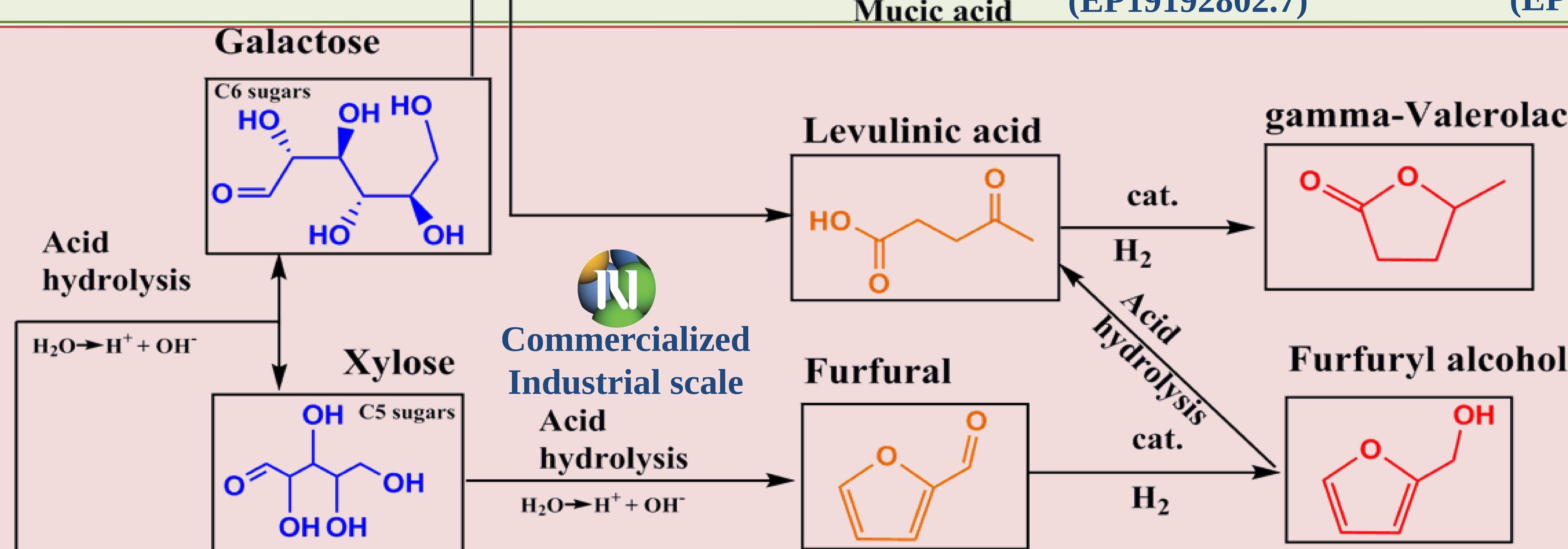
Value-added compounds
- Flavonoids
- Tannins
- Polyphenols



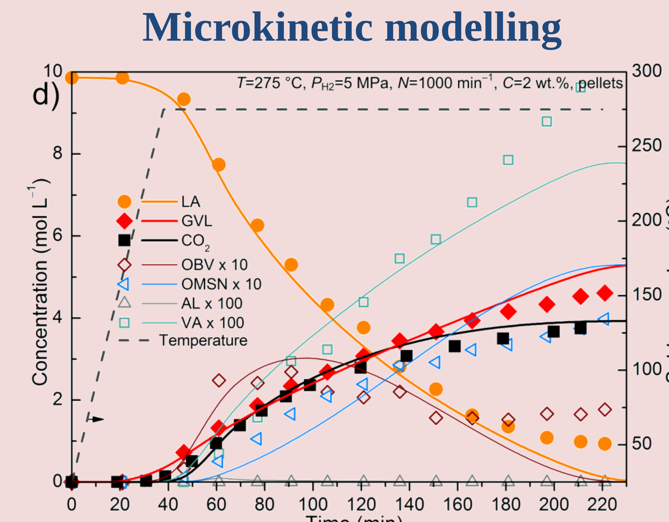
Cellulose

Ref: (4 – 9)





Microkinetic modelling



Hemicellulose

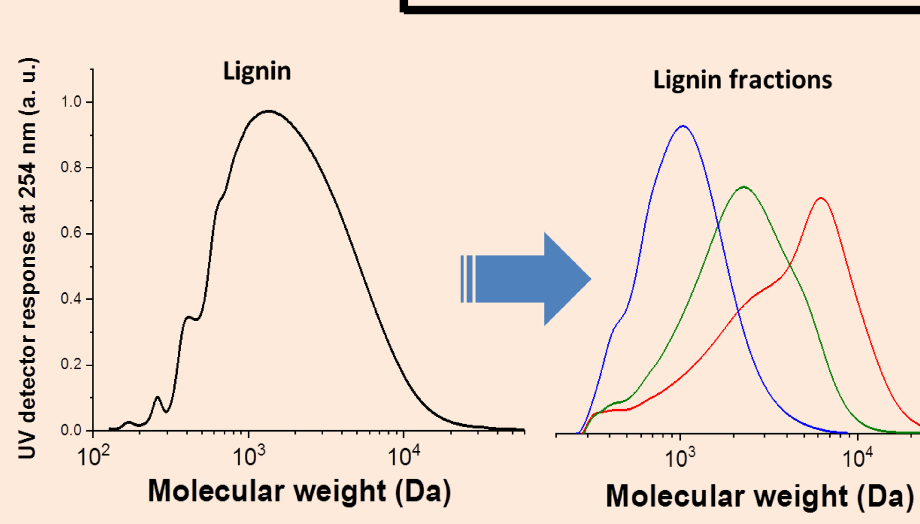
Ref: (10 – 12)

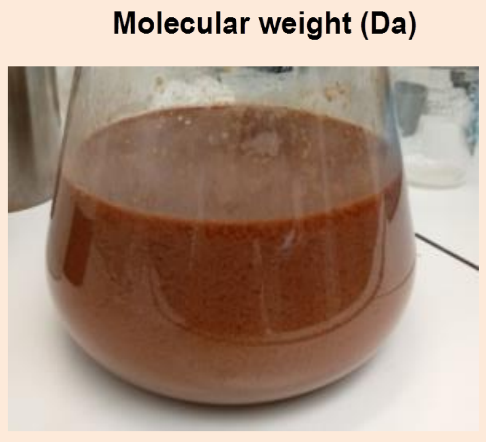
Lignin

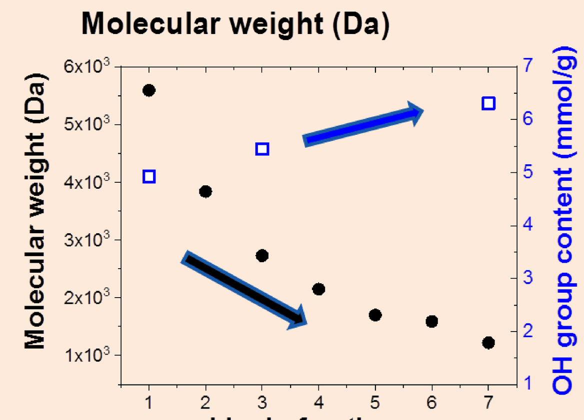
Ref: (13 – 17)

selective fractionation → Various lignin fractions —depolymerization→ Platform chemicals —(de)functionalisation→ Value-added Chemicals

Aromatic: -OH, -COOH, NH_2

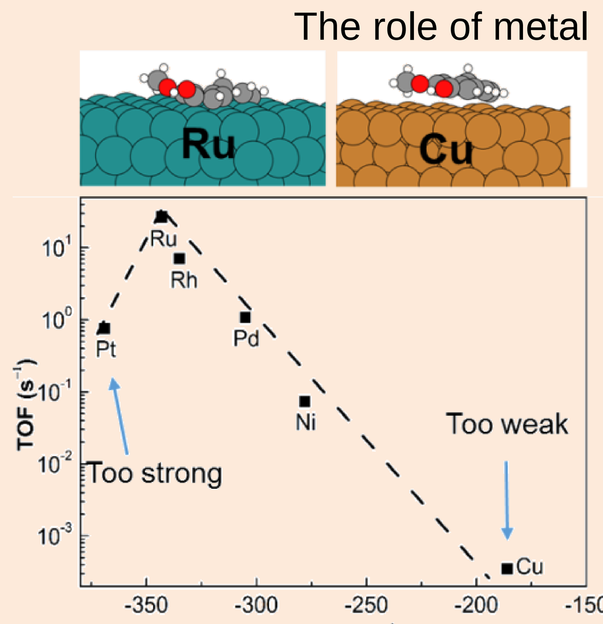




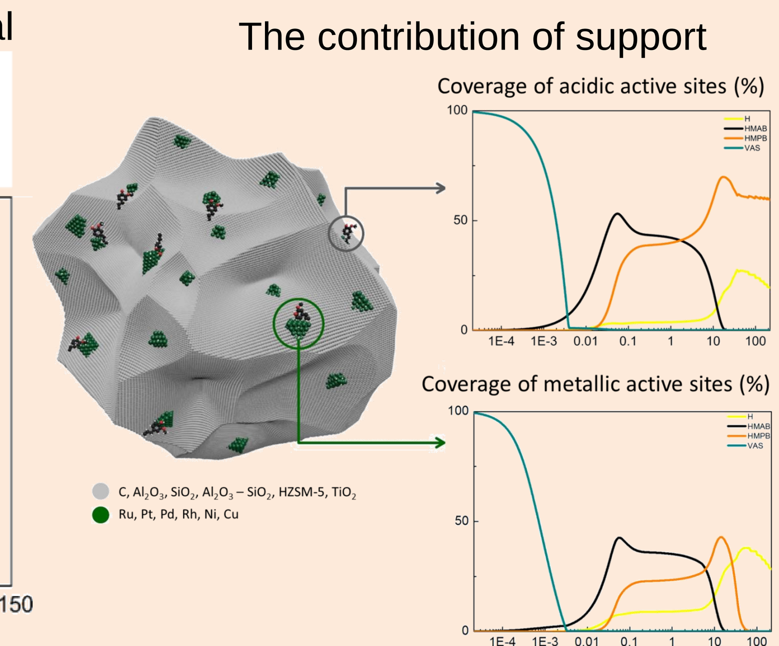


CATALYSIS & MULTI-SCALE MODELLING

The role of metal



The contribution of support



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