



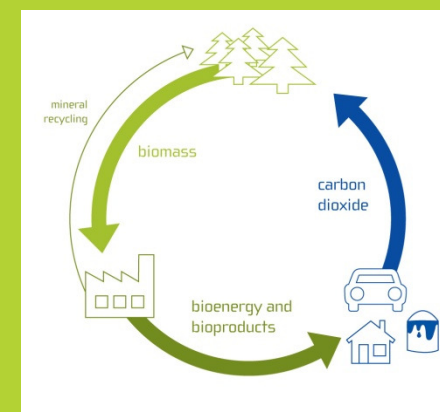
# BIOSYNERGY



Workshop 17th November 2010, Reims:

**Development of multi-product lignocellulose biorefinery technology  
– with focus on residues (pentoses, lignin)  
from cellulose ethanol production**

Results of the Integrated Project BIOSYNERGY (FP6)  
[www.biosynergy.eu](http://www.biosynergy.eu)





## Conclusions & perspectives technology development (1)

- Biosynergy RTD provides a solid basis for valorization of C5 sugars and lignin, fitting in a cellulose ethanol based biorefinery concept.
- Substantial advances reached on lab/bench scale. Several processes demonstrated on pilot scale in 2010.
- Lignin valorization (at least in part) to chemicals is an important tool for economic profitability of the biorefinery. Promising results attained for:
  - direct application of (organosolv) lignin in resins: 25-30 wt% phenol substitution
  - catalytic pyrolysis of lignin to phenolics
  - enzymatic lignin conversion (laccases) to improve reactivity
- Pretreatment and enzymatic hydrolysis are critical for fractionation, product quality and techno-economic feasibility:
  - Pretreatment technologies need to be optimised toward a particular goal.
  - Integrated development Feedstock<>pretreatment<>end-products is required.



## Conclusions & perspectives technology development (2)

Complexity lignocellulose feedstock adds to RTD challenge e.g.

- inhibitors in fermentations
- products often arise in complex mixtures >> (im)purity intermediates for chemical conversion

• On the other hand:

- Unexpected results: C5-surfactants from unpurified hemicellulose hydrolysates
- Application of fractions/product mixtures e.g. lignin in resins/adhesives, phenolics in resins, bitumen, .....

• Separation technology development is vital for both biochemical and thermochemical processing technologies > more effort needed