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► **To cite this version:**

Guillain Mauviel, Anthony Dufour, Jacques Lédé, Gabriel Wild, Francis Billaud. CURRENT RESEARCH DONE ON THERMOCHEMICAL CONVERSION OF BIOMASS AT THE REACTIONS AND CHEMICAL ENGINEERING LABORATORY -NANCY. Franco-Chinese Workshop on Processes for Energy and Environmental Issues, Jun 2014, Albi, France. hal-01227874

HAL Id: hal-01227874

<https://hal.science/hal-01227874>

Submitted on 12 Nov 2015

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CURRENT RESEARCH DONE ON THERMOCHEMICAL CONVERSION OF BIOMASS AT THE REACTIONS AND CHEMICAL ENGINEERING LABORATORY - NANCY

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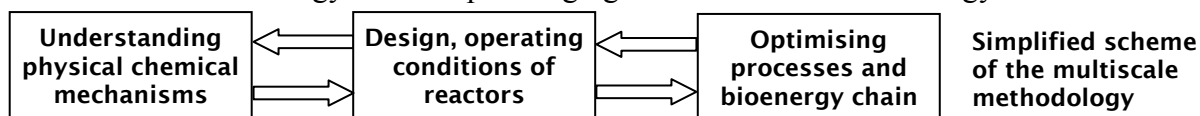
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Abstract

The talk will give an overview of current research developed at CNRS-LRGP Nancy (France) on the thermochemical conversion of lignocellulosic biomass. The main studied processes are pyrolysis and gasification to produce electricity, biofuels intermediates or value-added chemicals such as aromatics.

A multiscale methodology is developed ranging from molecular to bioenergy chain scales.



The studies at molecular and mesoscopic levels give insight into the mechanisms of biomass pyrolysis and are used to design reactors. Conversely, the detailed mass and energy balances of processes point out process units with low energy efficiency and/or high environmental impact and stress the improvement of reactors and the need of more fundamental knowledge.

The methodology will be highlighted by some examples:

1. At the mesoscopic and particle scales, the mechanism of biomass pyrolysis are studied by “slow” conventional setups (TGA, DSC) & by original “fast” setups (image furnace [1], micro fluidized bed). The extent of softening during biomass pyrolysis and interactions in the polymer network are revealed by in-situ analyses: NMR and rheology [2]. Advanced mass spectrometry is also used to analyse tar with Pr. F. Qi’s group (Hefei) [3].
2. At the reactor scale, a 3 kg/h pilot plant has been constructed to study fluidized bed pyrolysis or gasification (syngas quality, but also bed agglomeration).
3. At the process scale, models of thermochemical processes are developed under Aspen Plus [4]. Detailed mass and energy balances are obtained including pollutant emissions (trace species such as tar, NO_x, minerals, etc.). The effect of catalysts and reactor operating conditions are modelled [5]. These models point out the key process units and parameters detrimental to the energy and environmental efficiency.

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