

A pyrolysis biorefinery allows flexibility for the development of bio-based products from wood residues in a smart bioeconomy

Bio-based products from woody biomass pyrolysis for a sustainable bioeconomy

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INTRODUCTION

- There are 1110 kt DM of soft wood primary forest residues available for valorization per year in France.
- Objectives of the study :
 1. To better understand the impact of pyrolysis operational parameters on the properties of co-products,
 2. To establish a biorefinery scenario for the valorization of primary forest residues in which all co-products are valorized in the relevant markets.

METHODS

- Pyrolysis of woody biomass was studied in two experiments using an auger reactor:
 1. Optimization of bio-oil production,
 2. Fractional condensation for producing bio-crude oil and wood vinegar.
- A scenario was established for the harvest, conditioning and pyrolysis of 1000 kg DM of primary forest residues.

RESULTS AND DISCUSSION

- Fungicidal effect of wood vinegar was observed.
- Further pyrolysis experiments of Spruce to study fractional condensation are underway and allowed producing bio-crude oil with water and energy contents of 18.8 % and 18.3 MJ kg⁻¹, respectively.
- A foundation for a consequential LCA was established (see diagram below).

TABLE & FIGURES



	Exp. 1	Exp. 2	Scenario
Biomass	Spruce / Pine	Wood Bark	Soft wood residues
Pyrolysis parameters			
Temperature (°C)	559	600	559
Residence time (s)	61	90	61
N ₂ flow rate (L min ⁻¹)	3	3	3
1 st Cond. temp. (°C)	21	90	90
Products yields (wt%)			
Total bio-oil	58.3	36.0	58.3
Wood vinegar	-	13.0	22.2
Bio-crude oil	-	23.0	36.1
Biochar	26.6	25.0	26.6
Syngas	15.2	39.0	15.2
Bio-oil - water content (%)			
Total bio-oil	31.9	-	-
Wood vinegar	-	76.2	53.1
Bio-crude oil	-	33.0	18.8
Wood vinegar analysis (wt%)			
Phenolic compounds	-	3.7	8.2
Acetic acid	-	17.6	11.4
Energy content (MJ kg⁻¹)			
Bio-crude oil	-	-	18.3
Syngas	6.6	-	6.6

