EFFECT OF PRETREATMENT WITH AN ORGANIC SOLUTION ON YIELD AND QUALITY OF BIO-OIL OBTAINED FROM FAST PYROLYSIS OF SUGARCANE BAGASSE

Rodríguez-Machín, L.[1,2]; Arteaga-Pérez, L. E.[3]; Pérez-Bermúdez, R. A.[1]; Pala, M.[2]; Feys, J.[2], Nemmar, A[4]; Prins, W.[2]; Ronsse, F.[2]

CENTRO DE ESTUDIOS ENERGÉTICOS Y TECNOLOGÍAS AMBIENTALES (CEETA), UCLV[1]; DEPT. OF GREEN CHEMISTRY AND TECHNOLOGY, FACULTY OF BIOSCIENCE ENGINEERING, UGENT, BELGIUM[2]; CHEMICAL ENGINEERING SCHOOL, DEPARTMENT OF WOOD ENGINEERING, UNIVERSITY OF BÍO-BÍO, CHILE[3] AND DEPARTMENT OF PROCESS AND BIOPROCESS ENGINEERING, UNIVERSITY OF NANTES, FRANCE[4]

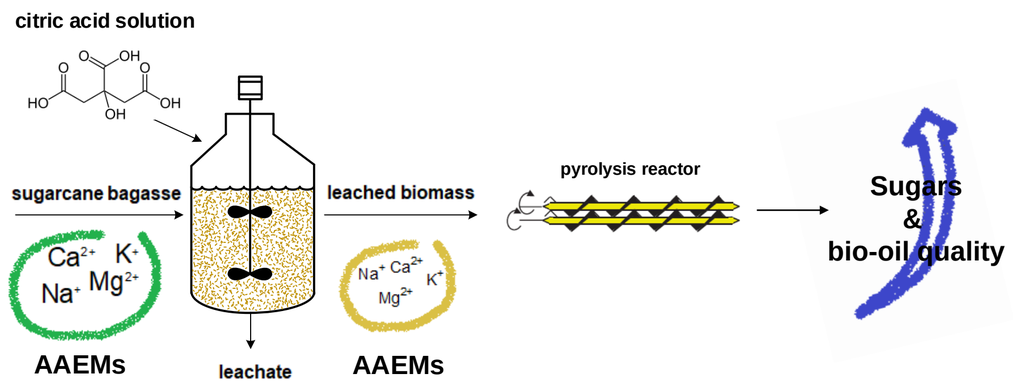
INTRODUCTION

Fast pyrolysis of lignocellulosic biomass is a non-selective thermal liquefaction that occurs in an oxygen depleted atmosphere, aiming to produce a liquid product known as bio-oil [1].

The bio-oil has potential as fuel or as a source of chemical building blocks for the synthesis of more valuable compounds [2]. However, bio-oil´s heterogeneous composition negatively influences its properties, such as high acidity and high reactivity during storage, affecting its long-term quality and stability [3].

When the bio-oil is obtained from sugarcane bagasse (SCB), it is particularly of inferior quality and unstable due to the rather high content of alkaline and alkaline earth metals (AAEMs), i.e. K, Ca, Mg, and Na present in the parent biomass [4]. The AAEMs removal from sugarcane bagasse *via* leaching with citric acid (CA) does not induce extensive hydrolysis and consequently smaller mass losses compared to mineral acids such as HCl or H_2SO_4 [5,6].

AIM OF THE WORK

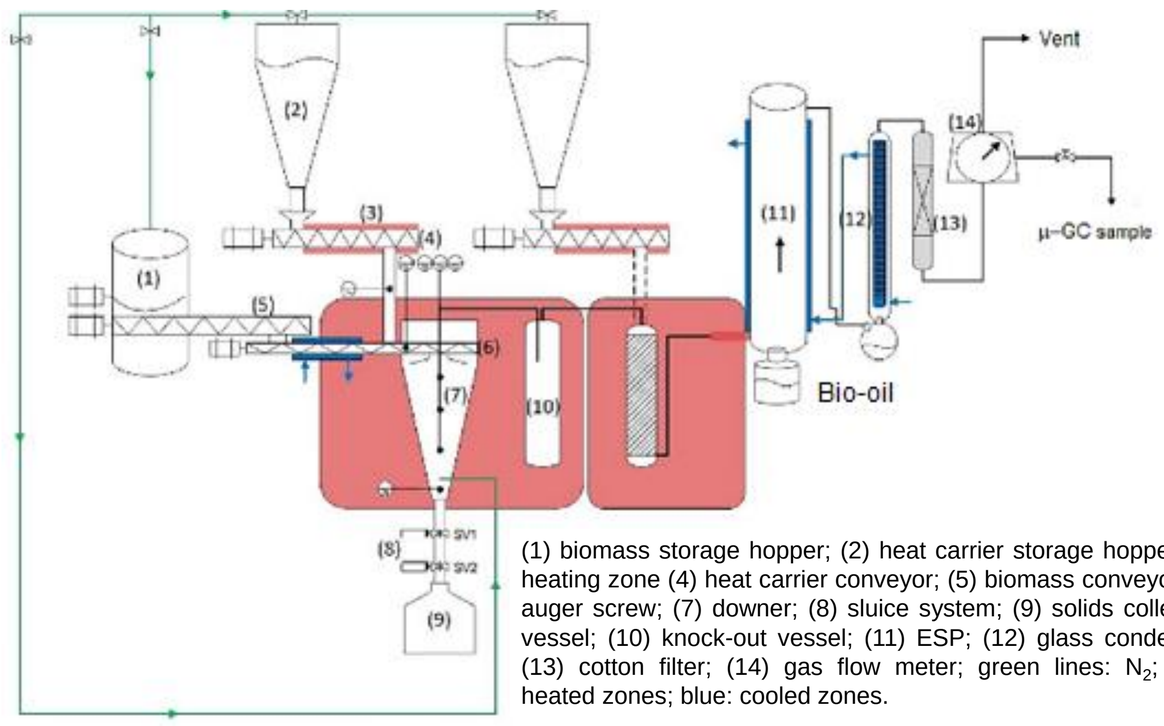


MATERIALS AND METHODS

Mini-plant experiments

- Raw or citric acid treated (1 h at 25°C) sugarcane bagasse as feedstocks.
- Continuously operated bench scale setup based on the auger reactor technology.
- Non-catalytic fast pyrolysis reactor temperature: 500 °C.

Schematic drawing of the mini-plant. Adapted from [7].



(1) biomass storage hopper; (2) heat carrier storage hopper; (3) heating zone (4) heat carrier conveyor; (5) biomass conveyor; (6) auger screw; (7) downer; (8) sluice system; (9) solids collection vessel; (10) knock-out vessel; (11) ESP; (12) glass condenser; (13) cotton filter; (14) gas flow meter; green lines: N_2; pink: heated zones; blue: cooled zones.

- Bio-oils were examined by pH, solids and water content (i.e. Karl Fisher Titration), the higher heating value (HHV, using a bomb calorimeter) and GC/MS analysis.

MAIN RESULTS

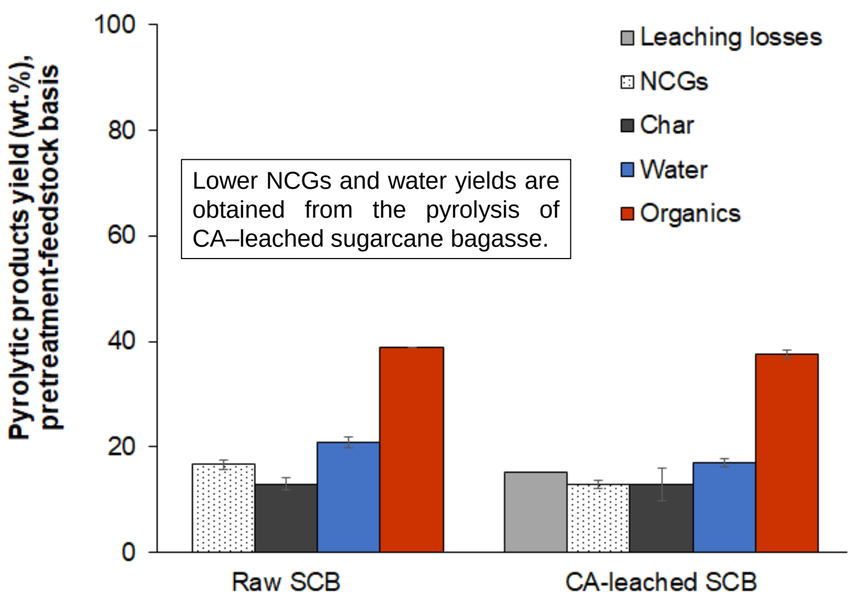


Fig. 1- Comparison of pyrolytic products yield derived from raw and CA–leached sugarcane bagasse. NCGs: non-condensable gases.

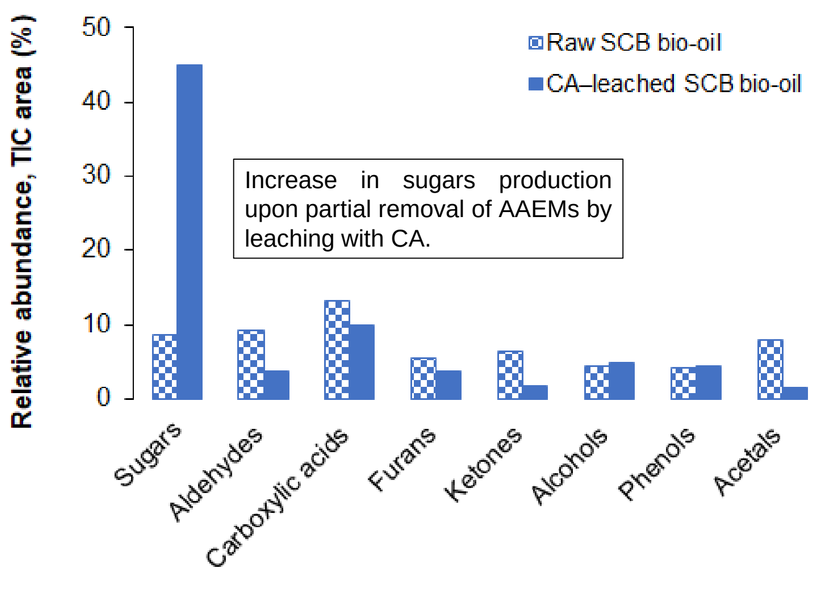


Fig. 2- Comparison of composition (by GC/MS) of bio-oils obtained from raw or treated sugarcane bagasse (SCB).

	Raw SCB bio-oil	CA–leached SCB bio-oil
pH	2.5	2.4
Solids (wt.%)	0.9	0.9
HHV (MJ/kg)	12.0	13.2

CONCLUSIONS

1. Partial removal of AEEM from sugarcane bagasse leached with citric acid (1 h at 25 °C) does not produce a substantial difference between pyrolytic organic yields, but yields less NCGs and water compared to the original material.
2. Leached sugarcane bagasse yielded a sizable increase in the production of sugars. However, do not exhibit high differences in terms of pH, solids content and HHV.
3. Citric acid can be considered as a technically viable option and as an effective leaching agent to demineralize biomasses, like sugarcane bagasse, prior to thermochemical conversion processes like fast pyrolysis.

FUTURE WORK

Future studies will be conducted in the mini-plant with raw or citric acid treated (1 h at 25°C) sugarcane trash as feedstocks to analyze the effect of AAEMs on pyrolytic products yields and its characteristics.

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Contact:

lizetr@uclv.edu.cu

Lizet.RodriguezMachin@ugent.be

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