A novel approach to biphasic strategy for intensification of the hydrothermal process to give levulinic acid: use of an organic non-solvent

Domenico Licursi, Claudia Antonetti, Rudy Parton, Anna Maria Raspolli Galletti

PII: S0960-8524(18)30743-0
DOI: https://doi.org/10.1016/j.biortech.2018.05.075
Reference: BITE 19981

To appear in: *Bioresource Technology*

Received Date: 30 March 2018
Revised Date: 18 May 2018
Accepted Date: 19 May 2018

Please cite this article as: Licursi, D., Antonetti, C., Parton, R., Raspolli Galletti, A.M., A novel approach to biphasic strategy for intensification of the hydrothermal process to give levulinic acid: use of an organic non-solvent, *Bioresource Technology* (2018), doi: https://doi.org/10.1016/j.biortech.2018.05.075

A novel approach to biphasic strategy for intensification of the hydrothermal process to give levulinic acid: use of an organic non-solvent

Domenico Licursi[a], Claudia Antonetti[a], Rudy Parton[b], Anna Maria Raspolli Galletti[a*]

[a] *Department of Chemistry and Industrial Chemistry, University of Pisa, Via G. Moruzzi 13, 56124, Pisa, Italy.* [b] *GFB Europe BV, Brightlands Chemelot Campus, Burg. Lemmensstraat 358, 6163JT, Geleen, The Netherlands*

*Corresponding author: anna.maria.raspolli.galletti@unipi.it

Levulinic acid is a platform chemical obtained from acid-catalyzed hydrothermal conversion of cellulose-rich biomass. The low amounts of solid biomass which can be handled in the reactor limit the levulinic acid concentration in the aqueous stream, making the economic viability of the aqueous phase process unsuitable for large scale applications. Now a novel approach to biphasic process has been proposed, where a mineral oil has been used as *non-solvent* for levulinic acid, thus concentrating it in the water phase, reducing the water volume to be processed downstream but at the same time maintaining enough liquid phase to sustain the slurry processability. The work has studied: *i)* the optimization of the biphasic hydrolysis of corn grain to levulinic acid; *ii)* the characterization of the recovered oil; *iii)* the evaluation of the energetic properties of the recovered hydrochar for its exploitation, thus smartly closing the biorefinery cycle.

Keywords: Levulinic acid, hydrothermal process, biphasic hydrolysis, mineral oil, hydrochar.

1. Introduction

Levulinic acid (LA), or 4-oxopentanoic acid, is a C5 keto-carboxylic acid obtained by acid-catalyzed hydrothermal conversion of C6-rich biomasses (Van der Waal and De Jong, 2016; Girisuta and Heeres, 2017). Due to its keto-carboxylic bifunctionality, this versatile molecule was proposed by the US