

Accepted Manuscript

Heterogeneous catalyst-assisted thermochemical conversion of food waste biomass into 5-hydroxymethylfurfural

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PII: S0960-8524(14)01488-6
DOI: <http://dx.doi.org/10.1016/j.biortech.2014.10.066>
Reference: BITE 14109

To appear in: *Bioresource Technology*

Received Date: 30 July 2014
Revised Date: 11 October 2014
Accepted Date: 13 October 2014

Please cite this article as: Parshetti, G.K., Suryadharma, M.S., Pham, T.P.T., Mahmood, R., Balasubramanian, R., Heterogeneous catalyst-assisted thermochemical conversion of food waste biomass into 5-hydroxymethylfurfural, *Bioresource Technology* (2014), doi: <http://dx.doi.org/10.1016/j.biortech.2014.10.066>

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1 **Heterogeneous catalyst-assisted thermochemical conversion of food waste biomass into 5-**
2 **hydroxymethylfurfural**

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7 **Abstract:**

8 A novel thermochemical conversion route has been developed that yields 5-
9 hydroxymethylfurfural (HMF) from food waste biomass (FWB) in the presence of a
10 heterogeneous catalysts (zirconium phosphate (ZrP)). The ZrP catalyst was prepared by
11 precipitation followed by calcination at 400 (ZrP-400) and 600 °C (ZrP-600) and was
12 characterized by SEM, XRD, XPS, N₂ sorption and NH₃-TPD. The optimized reaction
13 conditions were identified to maximize HMF yield by varying the type of catalyst, the catalyst
14 loading and the reaction time. The highest HMF yield achieved was 4.3%. On average 33%
15 higher yield for ZrP-600 was obtained compared to that for ZrP-400, which might be due to
16 higher number of acid sites on ZrP-600. The ZrP catalyst was easily regenerated by thermal
17 treatment and showed stable activity upon its reuse. Preliminary calculations of the "Minimum
18 selling price" of HMF suggest that it is economically attractive to make this industrially-relevant
19 chemical from FWB.

20 *Key words:* Thermochemical conversion, food waste biomass, 5-hydroxymethylfurfural,
21 zirconium phosphate, NH₃-TPD

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