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

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**Abstract:**

A novel thermochemical conversion route has been developed that yields 5-hydroxymethylfurfural (HMF) from food waste biomass (FWB) in the presence of a heterogeneous catalysts (zirconium phosphate (ZrP)). The ZrP catalyst was prepared by precipitation followed by calcination at 400 (ZrP-400) and 600 $^{o}$C (ZrP-600) and was characterized by SEM, XRD, XPS, $N_2$ sorption and $NH_3$-TPD. The optimized reaction conditions were identified to maximize HMF yield by varying the type of catalyst, the catalyst loading and the reaction time. The highest HMF yield achieved was 4.3%. On average 33% higher yield for ZrP-600 was obtained compared to that for ZrP-400, which might be due to higher number of acid sites on ZrP-600. The ZrP catalyst was easily regenerated by thermal treatment and showed stable activity upon its reuse. Preliminary calculations of the "Minimum selling price" of HMF suggest that it is economically attractive to make this industrially-relevant chemical from FWB.

*Key words:* Thermochemical conversion, food waste biomass, 5-hydroxylmethylfurfural, zirconium phosphate, $NH_3$-TPD

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