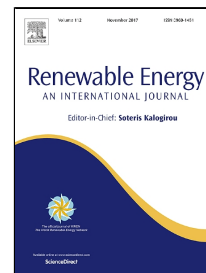


# Accepted Manuscript

Isoconversional Kinetics and Characteristics of Combustion on Hydrothermally Treated Biomass

Peiyong Ma, Jing Yang, Xianjun Xing, Sebastian Wehrich, Fangyu Fan, Xianwen Zhang



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1 Corresponding author: Xianwen Zhang  
2 Telephone number: +8618326056237  
3 Email address: xianwen.zhang@hfut.edu.cn

## 4 **Isoconversional Kinetics and Characteristics of Combustion on Hydrothermally** 5 **Treated Biomass**

6 Peiyong Ma<sup>1,2</sup>, Jing Yang<sup>2</sup>, Xianjun Xing<sup>1,3</sup>, Sebastian Wehrich<sup>1,3</sup>, Fangyu Fan<sup>4</sup> and Xianwen  
7 Zhang<sup>1,3\*</sup>

- 8 1. Institute of Advanced Energy Technology & Equipment, Hefei University of Technology, Hefei, Anhui  
9 230009, China;  
10 2. School of Mechanical Engineering, Hefei University of Technology, Hefei, Anhui 230009, China;  
11 3. School of Automobile and Transportation Engineering, Hefei University of Technology, Hefei, Anhui 230009,  
12 China;  
13 4. School of Chemistry and Chemical Engineering, Hefei University of Technology, Hefei, Anhui 230009, China.

### 14 **Abstract**

15 Pine sawdust and its resulting hydrochars hydrothermally produced at different time were  
16 characterized by scanning electron microscope and Fourier transform infrared spectroscopy to  
17 indicate the transformation in their morphologies and chemical structure, respectively. Afterwards,  
18 a comparative study in relation to the thermal behavior and combustion characteristics for the pine  
19 sawdust and the hydrochars was investigated. The relationship between the activation energy and  
20 various conversion rates of pine sawdust and hydrochars heated at various heating rates of 10, 20  
21 and 30 °C/min were evaluated by the methods of Kissenger-Akahira-Sunose (KAS) and Flynn-  
22 Wall-Ozawa (FWO). The results obtained from the two methods revealed that the activation  
23 energies of hydrochars fluctuate within a narrow range when the conversion rate is 0-0.55 and then  
24 decrease drastically at the conversion rate range of 0.55-0.95, due to the decomposition of relative  
25 reactive compounds. In comparison of the two methods, the average activation energies of  
26 hydrochars obtained at 6 h and 12 h using FWO method are 112.63 and 82.83 kJ/mol, respectively,  
27 larger than 107.70 and 76.30 kJ/mol using KAS method.

28 **Keywords:** Isoconversional method; hydrochar; combustion kinetics.

### 29 **1. Introduction**

30 It is a well-known problem that the fossil fuels as an energy source for mankind will be  
31 consumed in a foreseeable time and needed to be replaced with a regrowing natural resource like  
32 the inexhaustible source of biomass. In the last two decades, biomass-based energy has been  
33 extensively utilized to generate electricity because of the low-cost initial fuel and its indigenous  
34 characteristic [1]. Nearly 15% of the world's total energy consumption and as much as 35% of the  
35 energy used in developing countries, mostly for cooking and heating, come from biomass [2]. It was

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