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Effect of torrefaction on the properties of rice straw high temperature pyrolysis char: Pore structure, aromaticity and gasification activity

Handing Chen, Xueli Chen, Yueqiang Qin, Juntao Wei, Haifeng Liu

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1 Effect of torrefaction on the properties of rice straw high temperature
2 pyrolysis char: Pore structure, aromaticity and gasification activity.

3 **Handing Chen, Xueli Chen*, Yueqiang Qin, Juntao Wei, Haifeng Liu***

4 Key Laboratory of Coal Gasification and Energy Chemical Engineering of Ministry of Education, East China University of Science and
5 Technology, P. O. Box 272, Shanghai 200237, PR. China
6 Shanghai Engineering Research Center of Coal Gasification, East China University of Science and Technology, P. O. Box 272,
7 Shanghai 200237, PR. China

8 Abstract: The influence of torrefaction on the physicochemical characteristics of char during raw
9 and water washed rice straw pyrolysis at 800-1200 °C is investigated. Pore structure, aromaticity
10 and gasification activity of pyrolysis chars are compared between raw and torrefied samples. For
11 raw straw, BET specific surface area decreases with the increased torrefaction temperature at the
12 same pyrolysis temperature and it approximately increases linearly with weight loss during
13 pyrolysis. The different pore structure evolutions relate to the different volatile matters and pore
14 structures between raw and torrefied straw. Torrefaction at higher temperature would bring about a
15 lower graphitization degree of char during pyrolysis of raw straw. Pore structure and carbon
16 crystalline structure evolutions of raw and torrefied water washed straw are different from these of
17 raw straw during pyrolysis. For both raw and water washed straw, CO₂ gasification activities of
18 pyrolysis chars are different between raw and torrefied samples.

19 Keywords: torrefaction; pyrolysis; surface area; gasification activity; graphitization

20 **1. Introduction**

21 Biomass is an important renewable fuel, including woods, agricultural and forestry residues,
22 energy crops, wastes, etc. Compared with coal, biomass has the advantages of CO₂ neutral, lower

* Corresponding author.

Xueli Chen, Tel.: +86 21 64250734, E-mail addresses: cxl@ecust.edu.cn

Haifeng Liu, Tel.: +86 21 64251418, E-mail addresses: hfliu@ecust.edu.cn

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