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Devolatilization of wood and torrefied wood with different apparent density: Experimental and modelling study

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In this work, single particle combustion experiments on 3 mm raw and torrefied wood cubes of 5 different wood species with apparent density varying from 243 to 698 kg/m^3 were conducted, under conditions (1256 °C, 2.8% O_2, 27% H_2O) simulating the local conditions in a pulverized fuel boiler. The devolatilization time was determined based on flame extinction time, which was measured by a charge-coupled device (CCD) camera [1]. The devolatilization process was modelled by a non-isothermal single particle model presented in a previous paper [2]. The modelling results are in good agreement with experimental data as shown in Fig. 1. Both experimental and modelling results show that the devolatilization time increases linearly with the particle mass, even though different wood species with different apparent density are used in the experiments. The reason is that the devolatilization process is dominated by heat transfer. When the particle size is the same, higher density particles results in lower heating rate, mainly due to the increased thermal capacity of the particles. The results suggest that under the studied conditions, particle mass is a primary parameter that influences the devolatilization time of biomass particles.

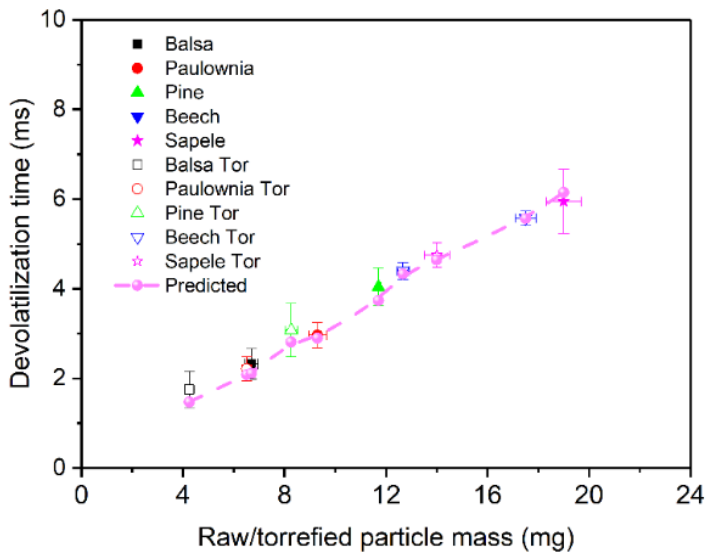

Fig. 1. The experimental measured and model predicted devolatilization time of wood species with different density

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References

[1] M. Momeni, C. Yin, S.K. Kær, T.B. Hansen, P.A. Jensen, P. Glarborg, Energy & Fuels. 27 (2013) 507–514.

[2] H. Luo, H. Wu, W. Lin, D.J. Kim, Nordic Flame Days, 2017.