

Supplementary Information

Kinetics and Reaction Chemistry for Slow Pyrolysis of Enzymatic Hydrolysis Lignin and Organosolv Extracted Lignin derived from Maplewood

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Fig. S1 shows TGA curves for lignin pyrolysis measured at various heating rates (dynamic conditions). All TGA curves for lignin pyrolysis show two apparent decomposition steps. The first decomposition step starts at around 450 K and continues till the second decomposition starts. The second decomposition appears above 550K at 1 K min⁻¹. At a fast heating rate, 150 K min⁻¹, the second decomposition occurs at a higher temperature (>> 1027 K) while the first decomposition shows delay of about 100 K.

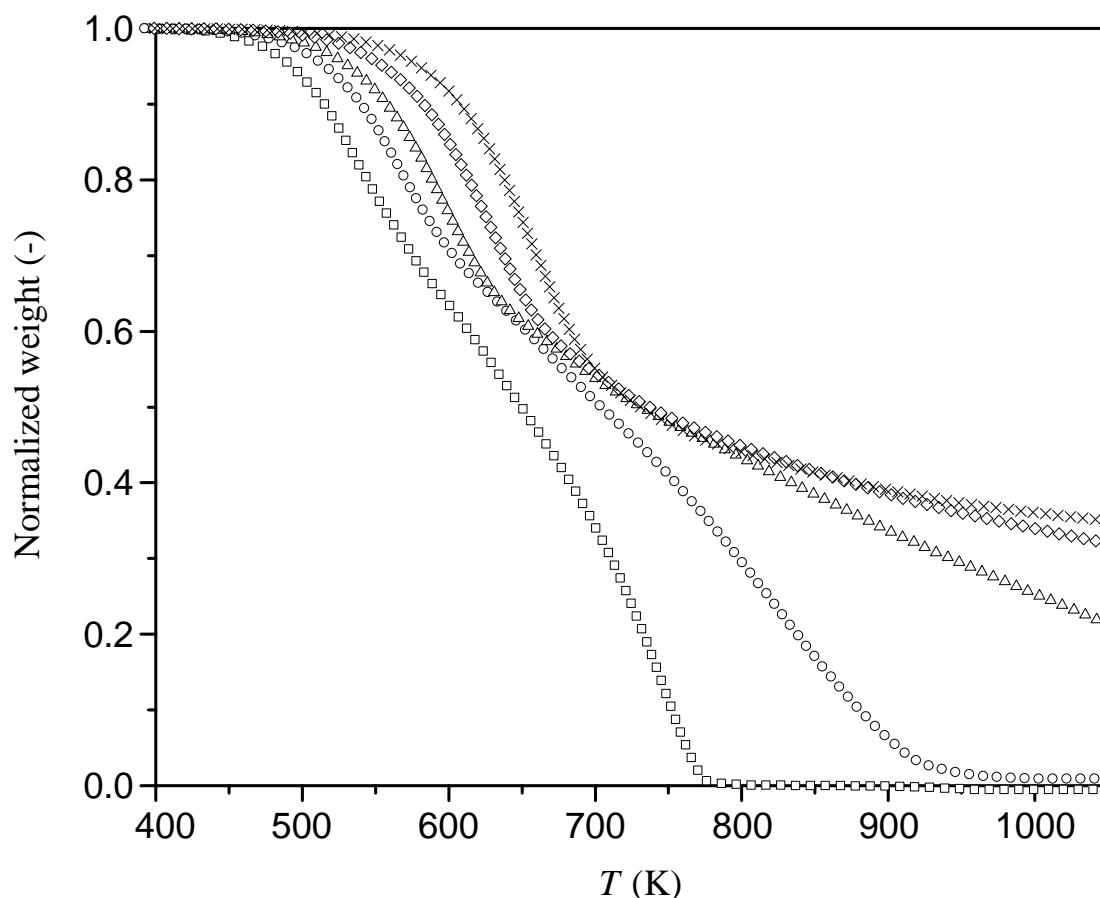


Fig. S1 TGA curves for the initial pyrolysis of solid lignin residue at heating ramps of 1(□), 5(○), 15(△), 50(◇), and 150 K min⁻¹(×).

Fig. S2 shows a comparison between an estimate weight loss curve and a dynamic TGA diagram at a heating rate of 1 K min^{-1} . The kinetic parameters summarized in Table 9 were used to predict the weight loss curve. In this comparison, it was assumed that the thermal gradient across the sample boundary can be neglected at such a slow heating rate. The decomposition at a low temperature ($<600\text{K}$) is governed by a low activation energy reaction step (path 1) while that at a high temperature by a high activation energy reaction step (path 2). The model prediction shows a good match except for a temperature range of $600\text{-}700\text{K}$. The slight deviation appears at the beginning of the second decomposition of a polyaromatic solid and is mainly attributed to the complex thermal-lag properties due to non-isothermal decomposition behaviour.

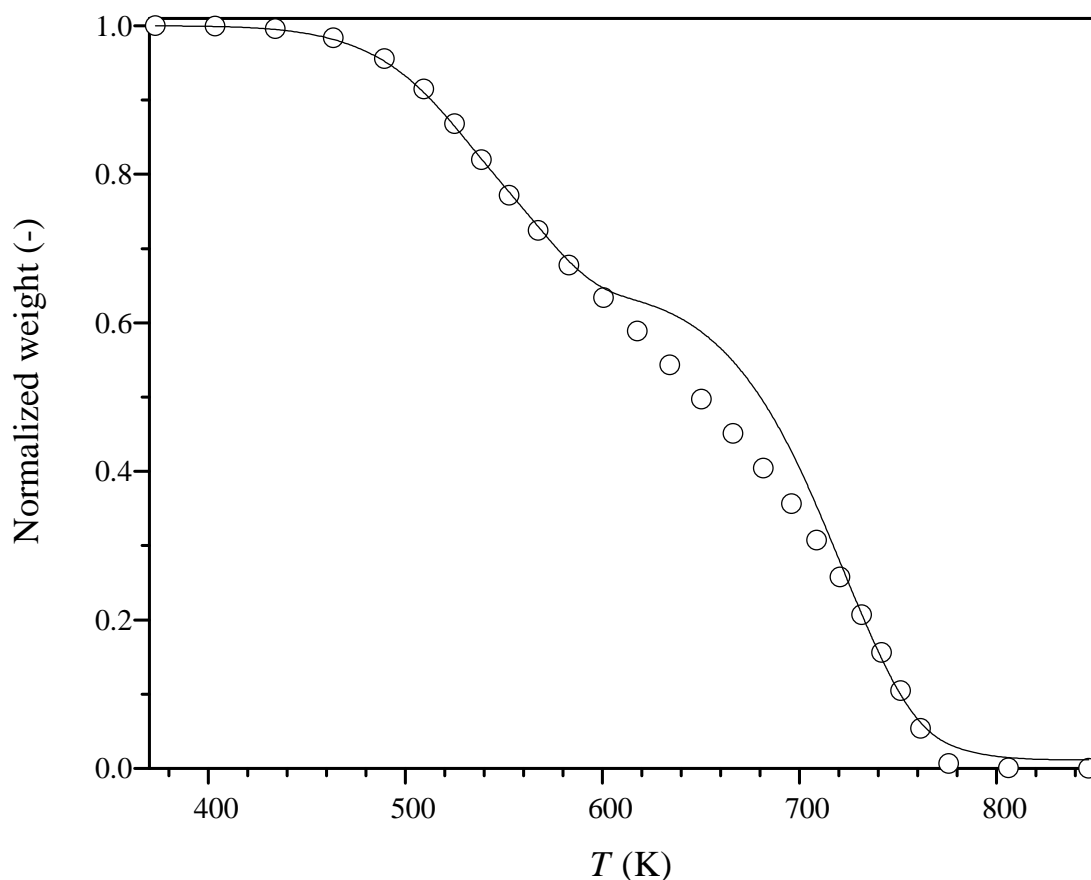


Fig. S2 Predicted (—) and observed (○) weight changes during lignin pyrolysis at a constant heating ramp of 1 K min^{-1}