Investigations on *Cunninghamia Lanceolate* Cedar Wood Pyrolysis by TG-FTIR and a Modified Discrete DAEM Kinetic

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S1. Calculations methods

All the calculations were realized by coding in MATLAB® (version R2017a). The estimations of E_i (Eq.(10)) through Vyazovkin method were optimized by *patternsearch* algorithm. Linear regressions with or without intercepts were performed by *fitlm* function in 95% confidence (*Student*'s test). The estimations of A_i whose slope were fixed (Eq.(15)) were realized by using *lsqcurvefit* and *fitlm* functions. Discrete DAEM of Eqs.(16) or (17) was solved by using *lsqlin* function. Confidence interval (*Student*'s type) with *s.t.* of w_i by *lsqlin* and *patternsearch* were studied by *bootci* and *boostrap* function via Boostrap Estimation with 95% confidence, sampling the data randomly and repeatedly 1000 times.

S2. Supplementary figures

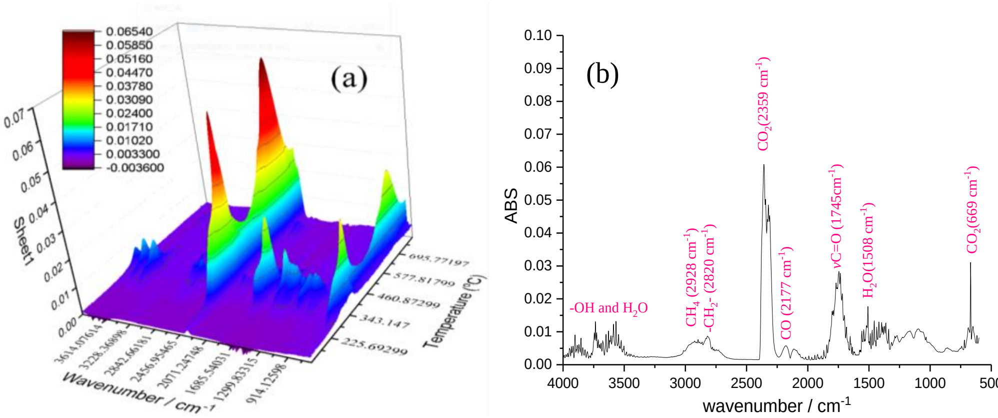

Fig.S1 TG-FTIR result of *cunninghamia lanceolate* cedar wood pyrolysis under 10°C/min for: (a) 3-D mapping; (b) assignments of functional groups at DTG peak.

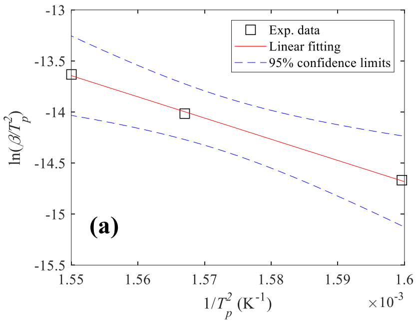

Fig.S2 E_0 estimation with Kissinger method of linear regression with Matlab.

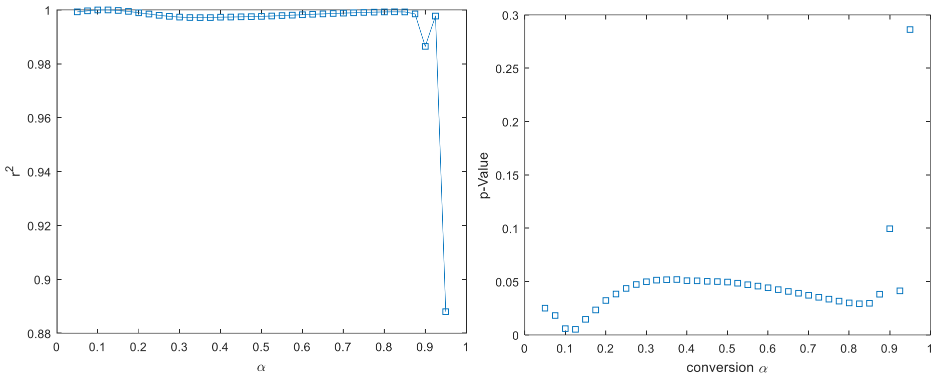

Fig.S3 Pre-exponential factors estimation via linear regression.

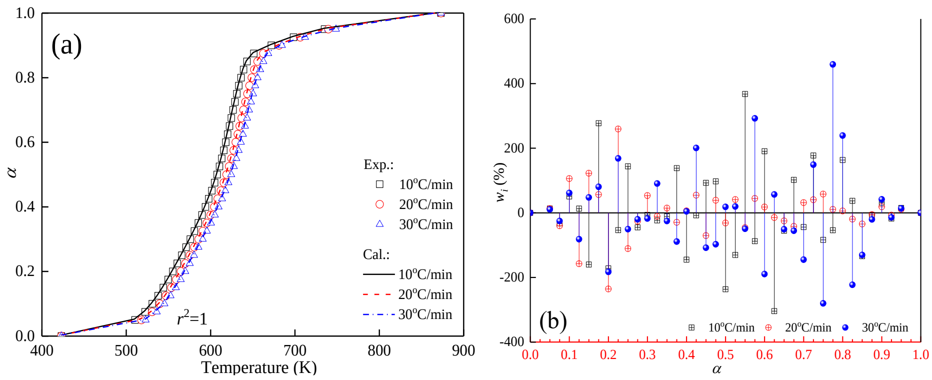

Fig.S4 Simulations of discrete DAEM without any constraint conditions.

S3. Supplementary tables

Table 1S Expressions of common mechanism funtions

No.	Code	$g(\alpha)$	$f(\alpha)$
Diffusion			
1	D1	α^2	$1/2\alpha$
2	D2	$(1-\alpha)\ln(1-\alpha)+\alpha$	$-1/\ln(1-\alpha)$
3	D3	$[1-(1-\alpha)^{1/3}]^2$	$1.5(1-\alpha)^{2/3}/[1-(1-\alpha)^{1/3}]$
4	D4	$[1-2/3\alpha-(1-\alpha)^{2/3}]$	$1.5/[(1-\alpha)^{-1/3}-1]$
Nucleation (Avrami-Erofeyev model)			
5	AE2	$[-\ln(1-\alpha)]^{1/2}$	$2(1-\alpha)\,[-\ln(1-\alpha)]^{1/2}$
6	AE3	$[-\ln(1-\alpha)]^{1/3}$	$3(1-\alpha)\,[-\ln(1-\alpha)]^{2/3}$
7	AE4	$[-\ln(1-\alpha)]^{3/4}$	$4/3(1-\alpha)\,[-\ln(1-\alpha)]^{1/4}$
8	AE1.5	$[-\ln(1-\alpha)]^{2/3}$	$1.5(1-\alpha)\,[-\ln(1-\alpha)]^{1/3}$
9	AE*n*[+]	/	$n(1-\alpha)\,[-\ln(1-\alpha)]^{(n-1)/n}$
Reaction order			
10	F1[+]	$\ln(1-\alpha)$	$(1-\alpha)$
11	F*n*(*n*≠1)	/	$(1-\alpha)^n$
Contracting geometry			
12	R2	$[1-(1-\alpha)^{1/2}]$	$2(1-\alpha)^{1/2}$
13	R3	$[1-(1-\alpha)^{1/3}]$	$3(1-\alpha)^{2/3}$
Power law			
14	P2	$\alpha^{1/2}$	$2\alpha^{1/2}$
15	P3	$\alpha^{1/3}$	$3\alpha^{2/3}$
16	P4	$\alpha^{1/4}$	$4\alpha^{3/4}$
17	P23	$\alpha^{2/3}$	$(2/3)\alpha^{-1/2}$

[+] when *n*=1, the AE1 model equates to F1 model.