Table 3. Kinetics methods used in WT pyrolysis mechanism's study

Method	General Equation	Description
Model-fitting methods		
Coats-Redfern Method	$\ln\frac{g(\alpha)}{T^2} = \ln\left(\frac{AR}{\beta E_a}\left[1-\left(\frac{2RT_{exp}}{E_a}\right)\right]\right) - \frac{E_a}{RT}$ (20)	A plot of $\ln\frac{g(\alpha)}{T^2}$ against $1/T$ for low values of α, should be a straight line with a slope of $-E/R$ since $\ln\left(\frac{AR}{\beta E_a}\left[1-\left(\frac{2RT_{exp}}{E_a}\right)\right]\right)$ is sensibly constant. The activation energy and A are obtained from the slope, and the intercept, respectively and the model that gives the best linear fit is chosen as the model.
Direct differential method	$\ln\frac{d\alpha/dT}{f(\alpha)} = \ln\frac{A}{\beta} - \frac{E_a}{RT}$ (21)	Plotting the left-hand side (including the model) versus $1/T$ gives the E_a and A from the slope and y intercept, respectively. The model that gives the best linear fit is usually chosen as the model.
Freeman-Carroll Difference-Differential	$\frac{\Delta\ln\frac{d\alpha}{dT}}{\Delta 1/T} = \frac{\Delta\ln f(\alpha)}{\Delta 1/T} - \frac{E_a}{R}$ (22) or $\frac{\Delta\ln\frac{d\alpha}{dT}}{\Delta 1/T} = -\frac{E_a}{R}\frac{\Delta 1/T}{\Delta\ln f(\alpha)}$ (23)	The activation energy is obtained by plotting the left-hand side of Eq. (22) and Eq. (23) (23) $\frac{\Delta\ln f(\alpha)}{\Delta 1/T}$ and evaluating the intercept for Eq. (22) or versus $\frac{\Delta 1/T}{\Delta\ln f(\alpha)}$ and evaluating the slope for Eq. (23).
Model-free methods		
Friedman's isoconversional method	$\ln\left(\beta\frac{d\alpha}{dt}\right)_\alpha = \ln A_\alpha + \ln f(\alpha) - \frac{E_{a\alpha}}{RT_\alpha}$ (24)	Plotting $\ln\left(\beta\frac{d\alpha}{dt}\right)$ versus $1/T$ at given reaction progress, α, for various heating rates yields a straight line with slope $-E_a/R$. The E_a can be obtained from this slope without knowing the reaction function$f(\alpha)$. The pre-exponential factor A is the y-intercept of the straight line.
Ozawa method	$\ln\beta = \ln\left(\frac{AE}{g(\alpha)R}\right) - 5.330 - 1.052\frac{E}{RT}$ (25)	Provided that $g(\alpha)$ is constant at a given value of α, the slope of the plots of $\ln\beta$ vs the reciprocal of the temperature for particular values of α lead to the activation energy as a function of α, independently of the kinetic model fitted by the reaction.
Kissinger method	$\ln\left(\frac{\beta}{T_m^2}\right) = \ln\left(\frac{AR}{f(\alpha)}\right) - \frac{E_a}{RT_m}$ (26)	A plot of $ln\left(\frac{\beta}{T_m^2}\right)$ versus $1/T_m$, at various heating rates yields a straight line that allows determination of the E_a from the gradient of the straight line, $\frac{-E_a}{R}$. The y-intercept serves to estimate the pre-exponential reaction rate factor.
Kissinger-Akira-Sunose (KAS) method	$\ln\left(\frac{\beta}{T^2}\right) = \ln\left(\frac{AR}{E_a}\right) - \ln g(\alpha) - \frac{E_a}{RT}$ (27)	The plot of $\ln\left(\frac{\beta}{T^2}\right)$ vs $1/T$ for a constant value of α will develop a straight line. The E_a is determined by the gradient of the curve, represented by $-E/R$ through multiplication with gas constant, R.
Ozawa- Flynn-Wall (OFW) method	$\ln\beta = \ln\left(\frac{AE_a}{R}\right) - \ln g(\alpha) - 5.3305 - 1.052\left(\frac{E_a}{RT}\right)$ (28)	For α constant, a plot of $\ln\beta$ vs $1/T$ obtained from thermal curves recorded at several heating rates should be a straight line whose slope allows evaluation of the E_a. The pre-exponential factor value can be obtained from the intercept if the form of the integral function $g(\alpha)$ is known.
Starink Method	$\ln\left(\frac{\beta}{T^{1.8}}\right) = C_s - 1.0037\left(\frac{E_a}{RT}\right)$ (29)	Starink's activation energy is obtained from the slope of $\ln\left(\frac{\beta}{T^{1.8}}\right)$ against 1/T whilst C_s is a constant independent of β and T.