Supporting Information

Synthesis of a renewable bisguaiacol amide and its hydrogen bonding effect on enhancing polybenzoxazine performance

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Supporting information

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Equations for calculating Ea of the polymerization

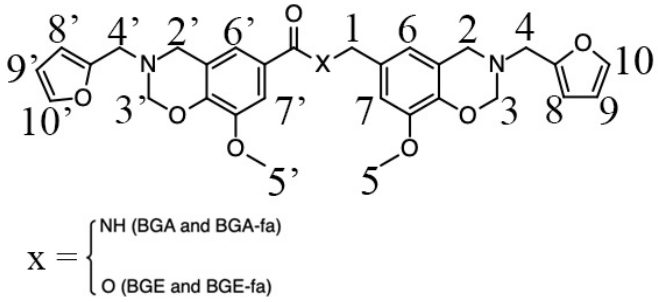
The apparent activation energy (E_a) of the polymerization was calculated basing on the following well-known Kissinger (eq S1) and the modified Ozawa (eq S2) methods.

$$-\ln\left(\frac{\beta}{T_p^2}\right) = \frac{E_a}{RT_p} - ln(\frac{AR}{E_a})$$

$$ln\beta = -1.052 \times \frac{E_a}{RT_p} + C$$

where β is the heating rate, the exothermic peak temperature is T_p, and R is the gas constant.

Table S1 The ^{1}H NMR data of benzoxazines



X = { NH (BGA and BGA-fa); O (BGE and BGE-fa) }

Proton number	Chemical shift (ppm) and integrated areas	
	BGA-fa	BGE-fa
1	4.51 (2.00)	5.23 (2.00)
2; 2’	4.00; 4.02 (4.00)	4.05; 4.06 (4.00)
3; 3’	4.97; 5.03 (3.98)	5.01; 5.09 (4.04)
4; 4’, 5; 5’	3.92-3.94 (10.06)	3.92-3.97 (9.96)
6; 6’	6.76 (0.96); 7.32 (1.02)	6.88(0.98); 7.51 (1.02)
7; 7’	6.57 (0.96); 6.96 (0.98)	6.71(1.00); 6.97 (0.94)
8; 8’	7.41 (1.98)	7.44 (2.00)
9; 9’, 10; 10’	6.26-6.33 (4.08)	6.28-6.36 (4.04)

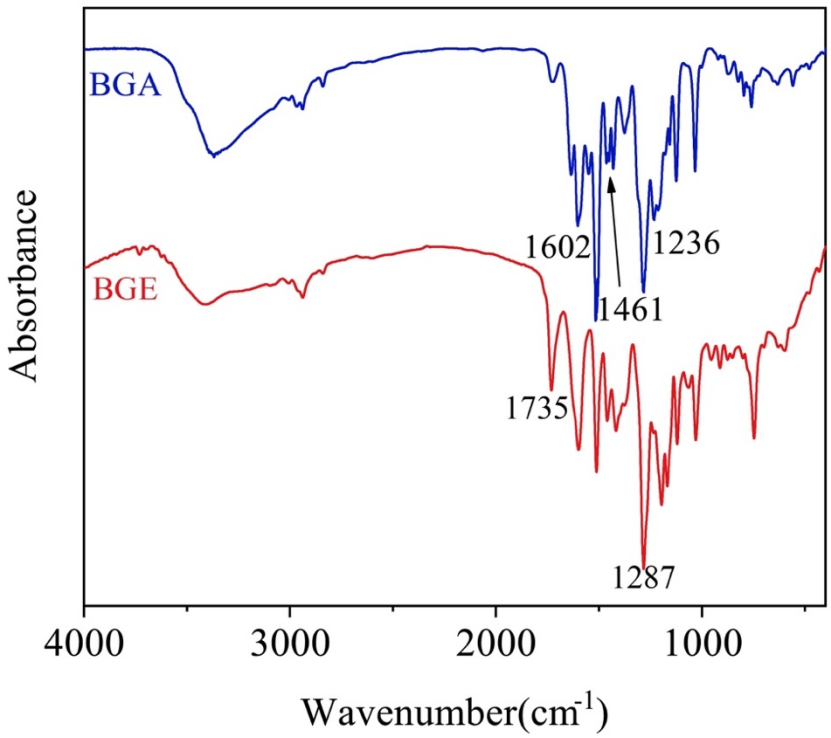


Figure S1 FTIR spectra of BGA and BGE.

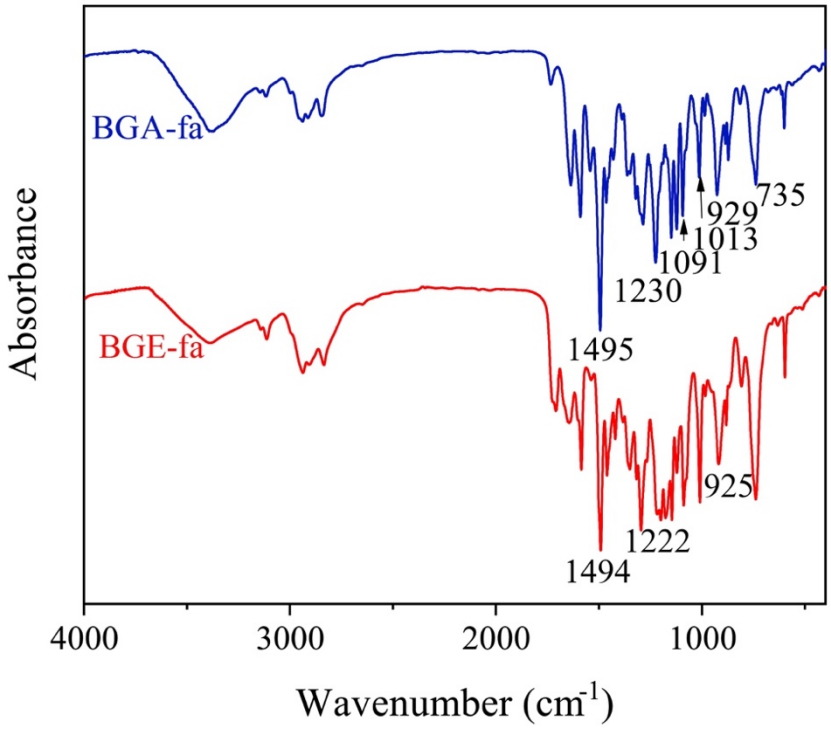


Figure S2 FTIR spectra of BGA-fa and BGE-fa.

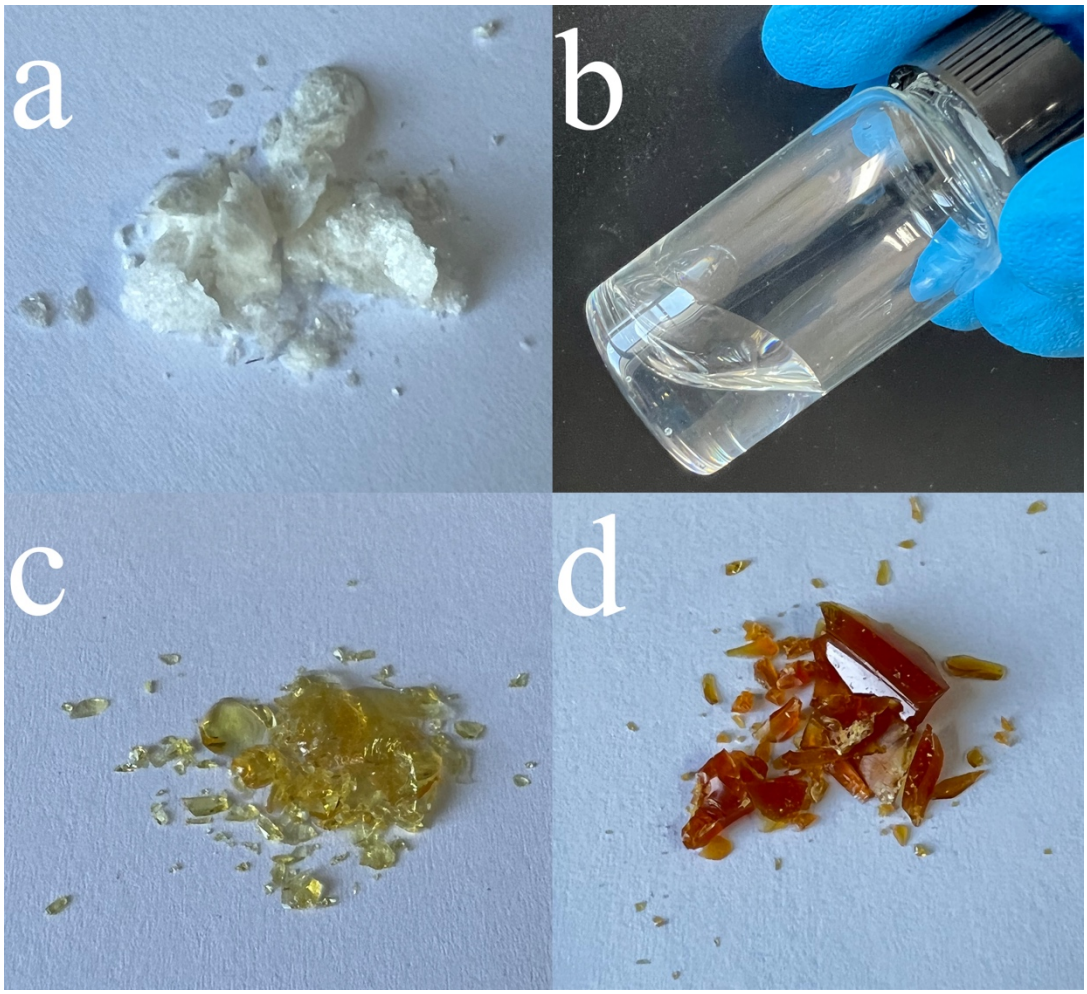


Figure S3 Optical image of a) BGA, b) BGE, c) BGA-fa and d) BGE-fa.

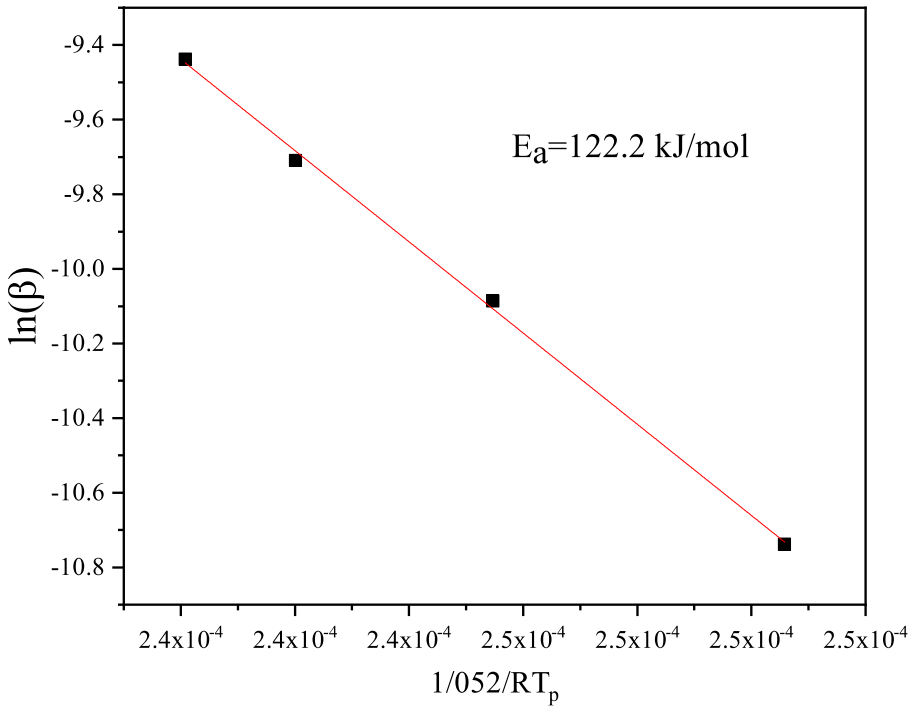


Figure S4 Plots for calculate the Ea of BGA-fa using Kissinger method.

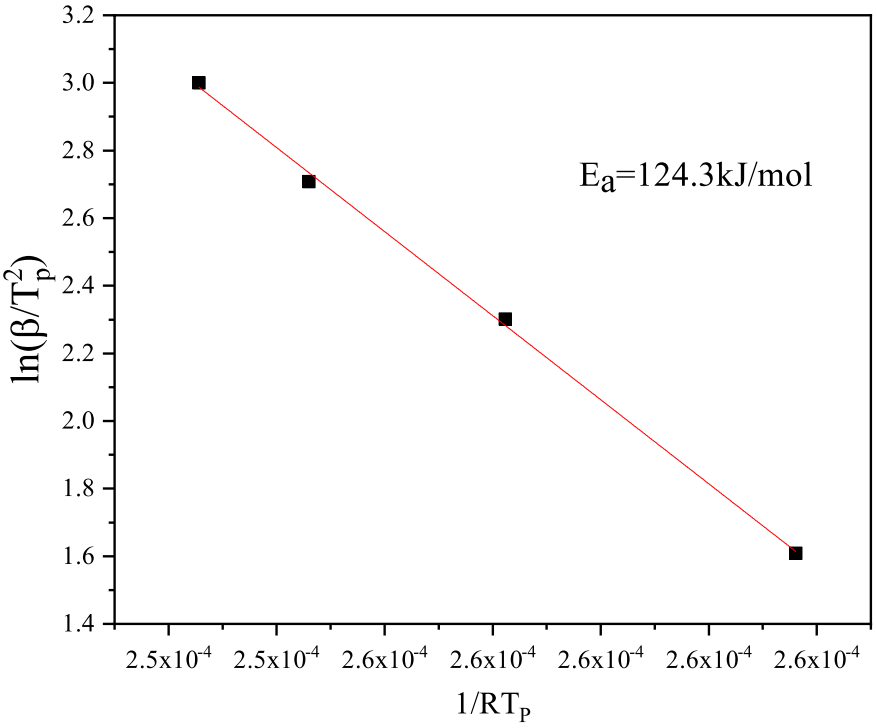


Figure S5 Plots for calculate the Ea of BGA-fa using Ozawa method.

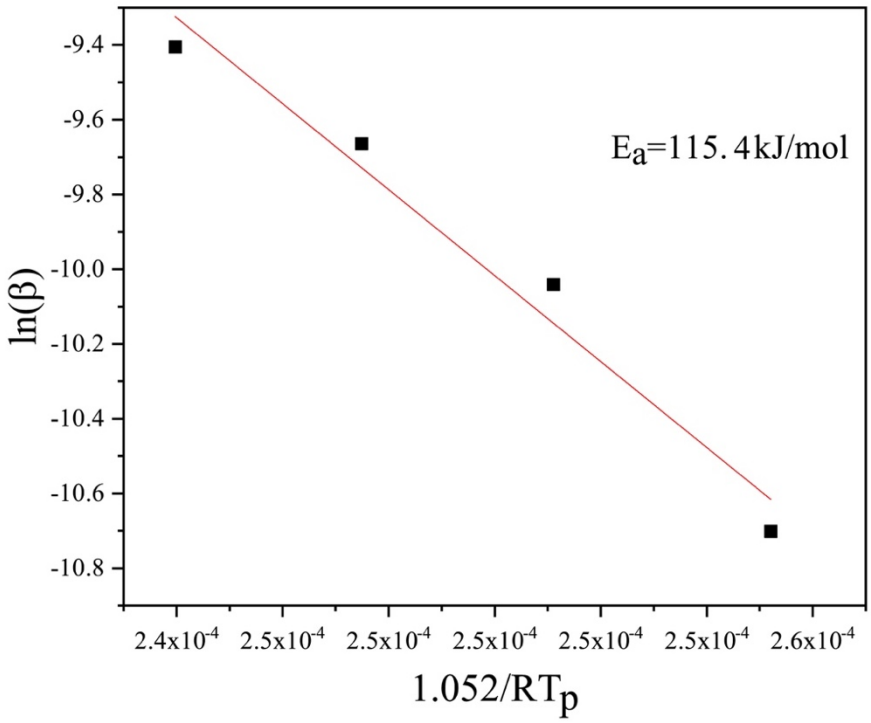


Figure S6 Plots for calculate the Ea of BGE-fa using Kissinger method.

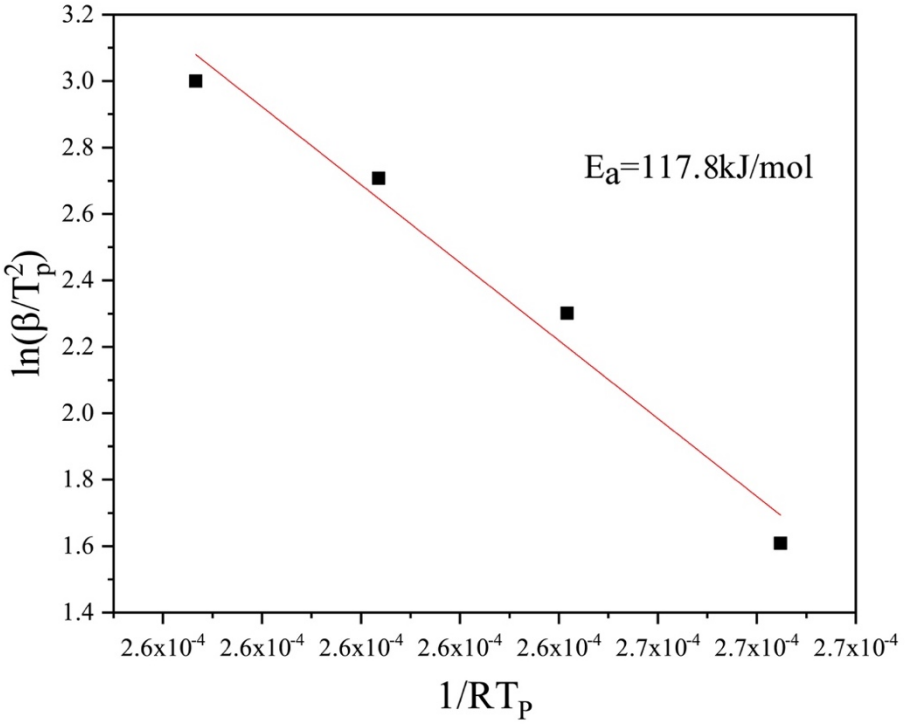


Figure S7 Plots for calculate the Ea of BGE-fa using Ozawa method.

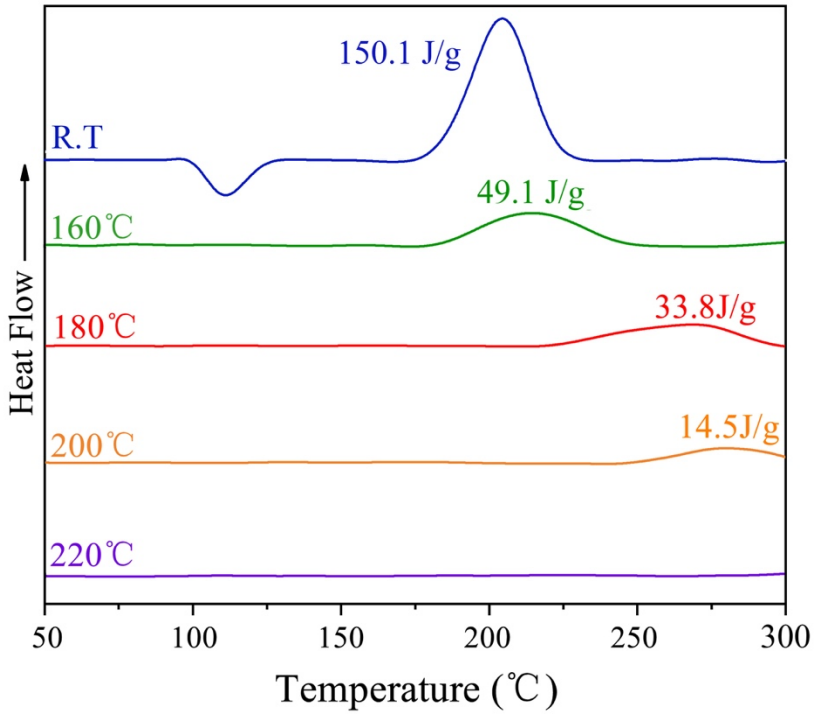


Figure S8 DSC thermograms of BGE-fa during the step-by-step polymerization reaction.

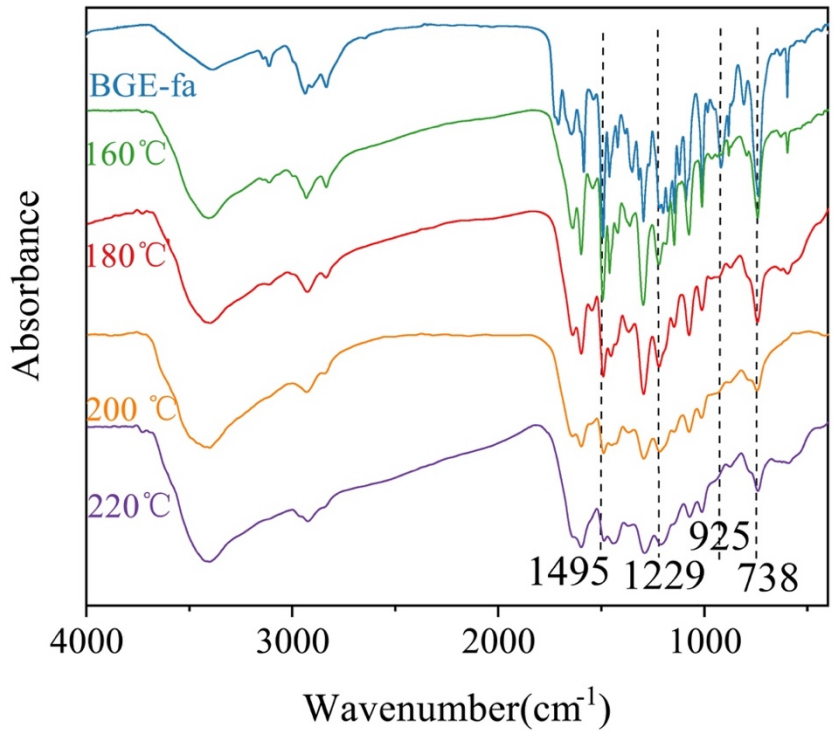


Figure S9 FTIR spectra of BGE-fa during step by step polymerization reaction

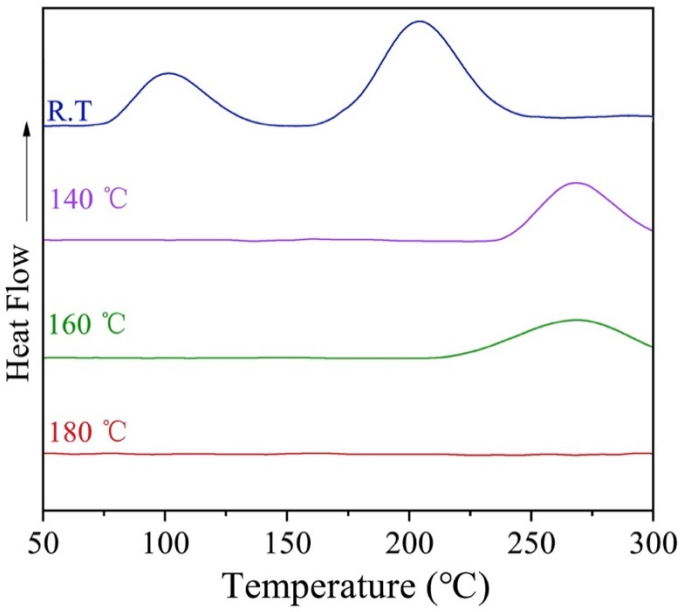


Figure S10 DSC thermograms of BGA-fa catalyzed by 10 wt% PTSM.

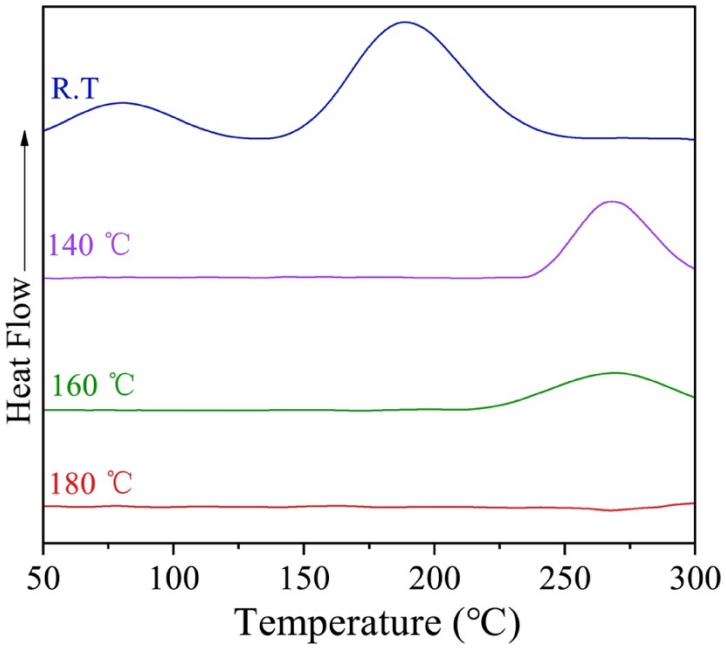


Figure S11 DSC thermograms of BGE-fa catalyzed by 10 wt% PTSM.

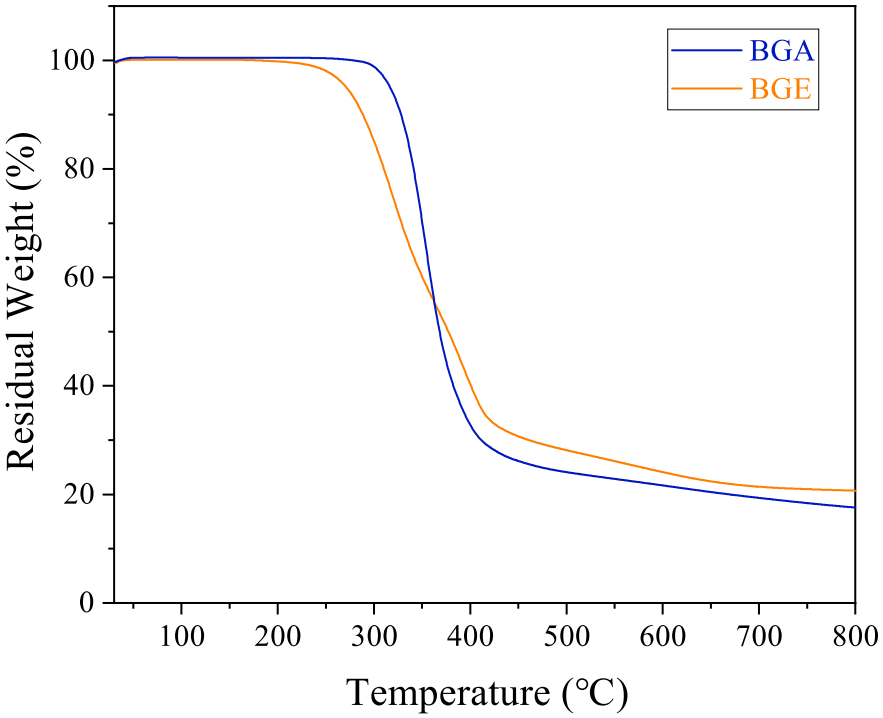


Figure S12 TGA curves of bisguaicols.

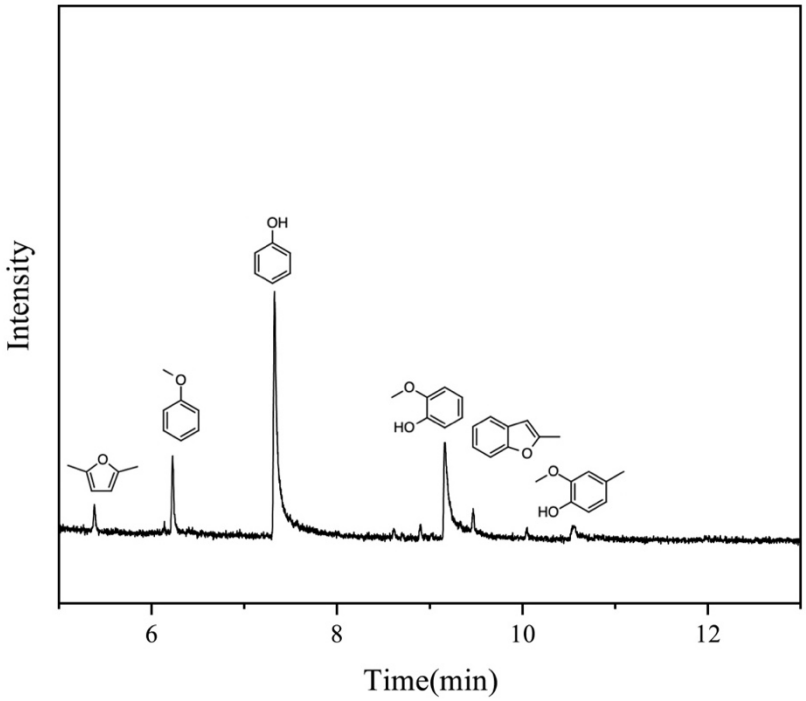


Figure S13 GC spectrum of the poly(BGA-fa) decomposed at 300 °C.

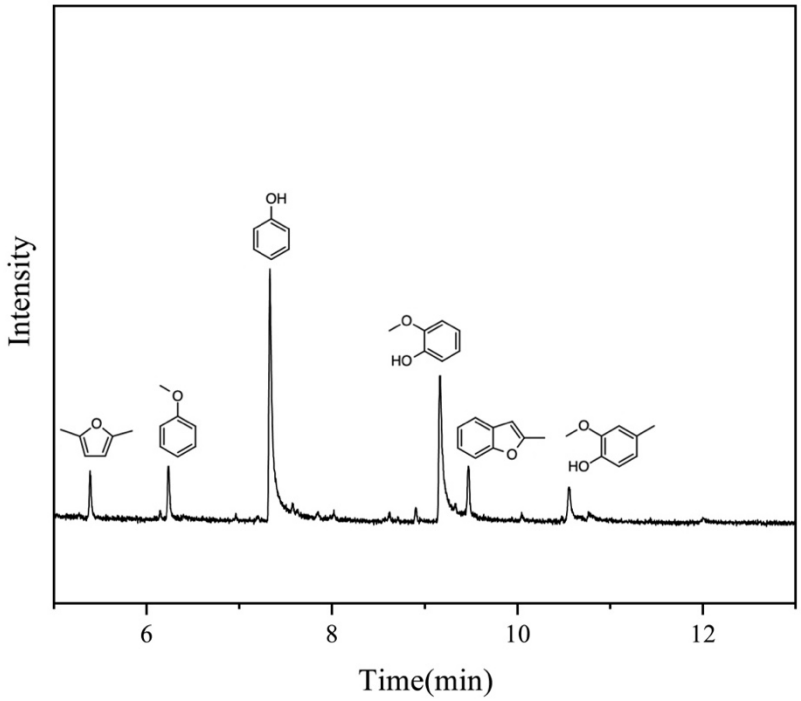


Figure S14 GC spectrum of the poly(BGA-fa) decomposed at 340 °C.

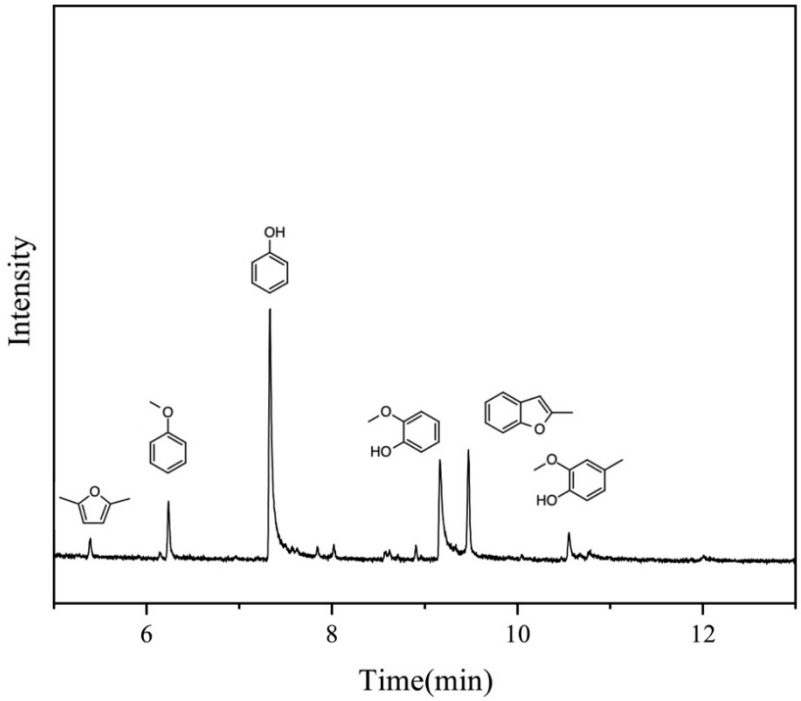


Figure S15 GC spectrum of the poly(BGA-fa) decomposed at 380 °C.

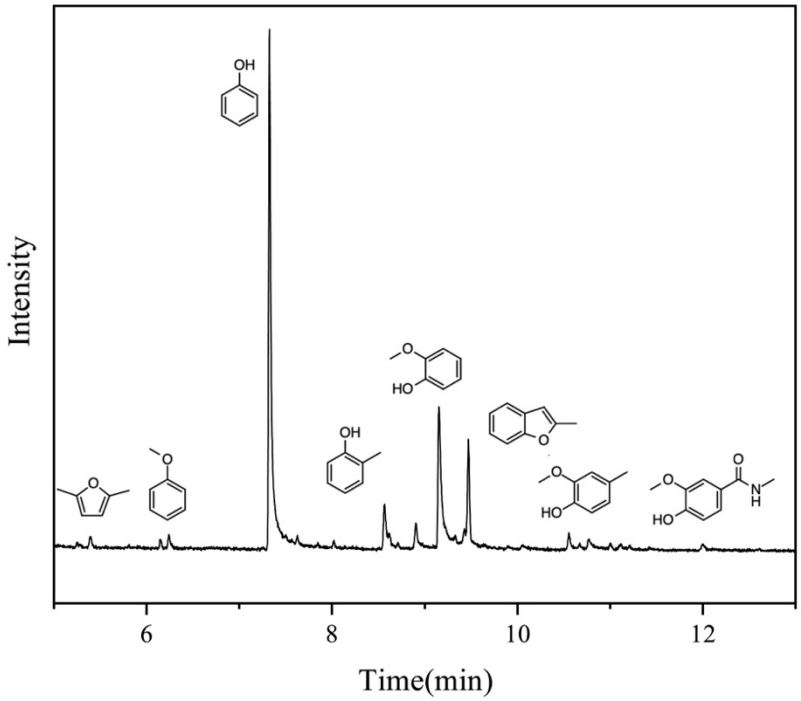


Figure S16 GC spectrum of the poly(BGA-fa) decomposed at 420 °C.

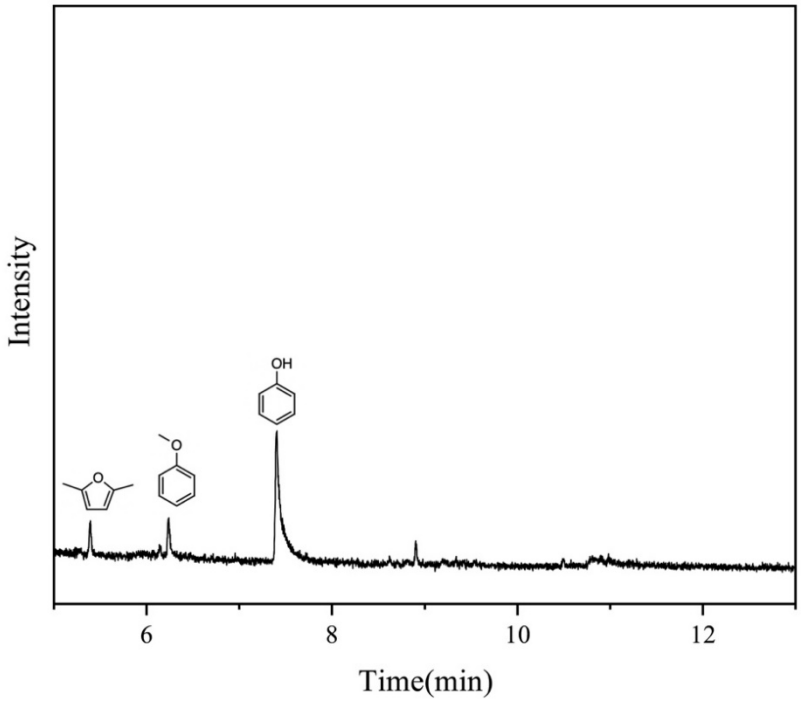


Figure S17 GC spectrum of the poly(BGE-fa) decomposed at 300 °C.

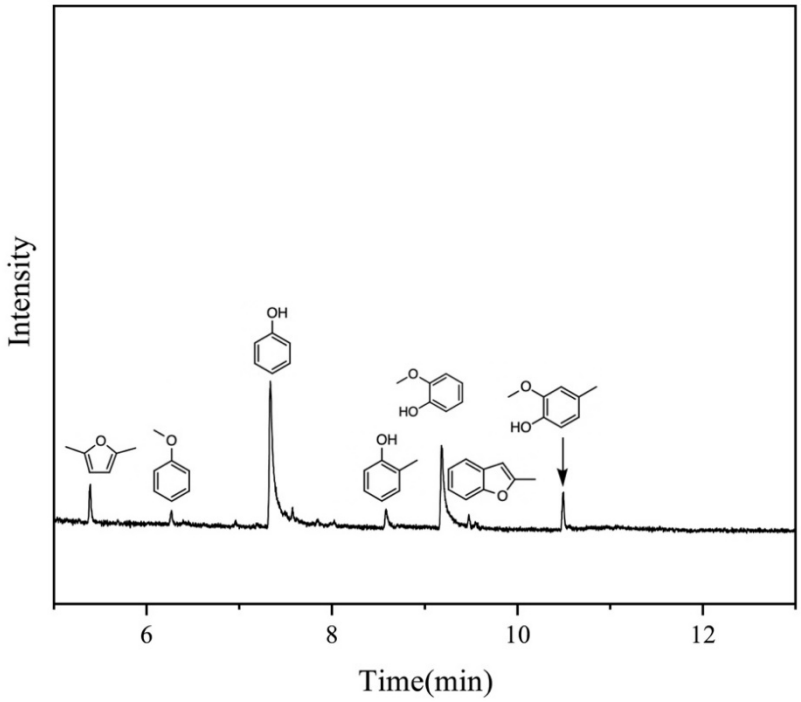


Figure S18 GC spectrum of the poly(BGE-fa) decomposed at 340 °C

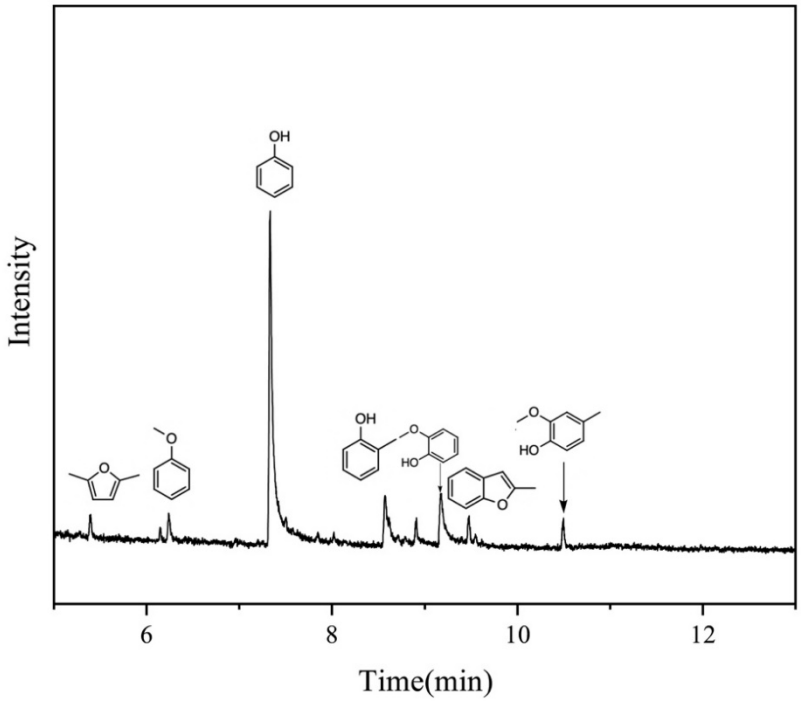


Figure S19 GC spectrum of the poly(BGE-fa) decomposed at 380 °C.

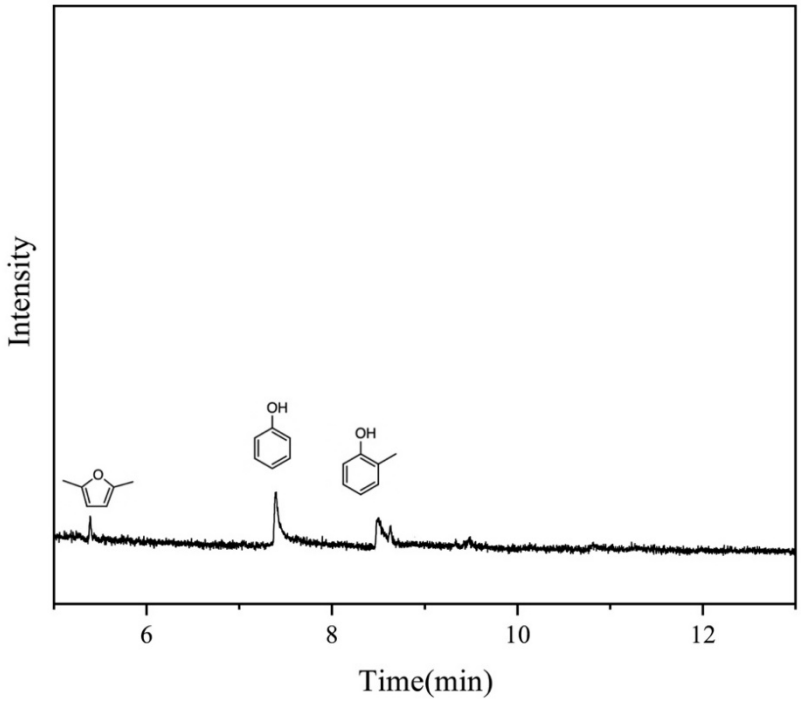


Figure S20 GC spectrum of the poly(BGE-fa) decomposed at 420 °C.

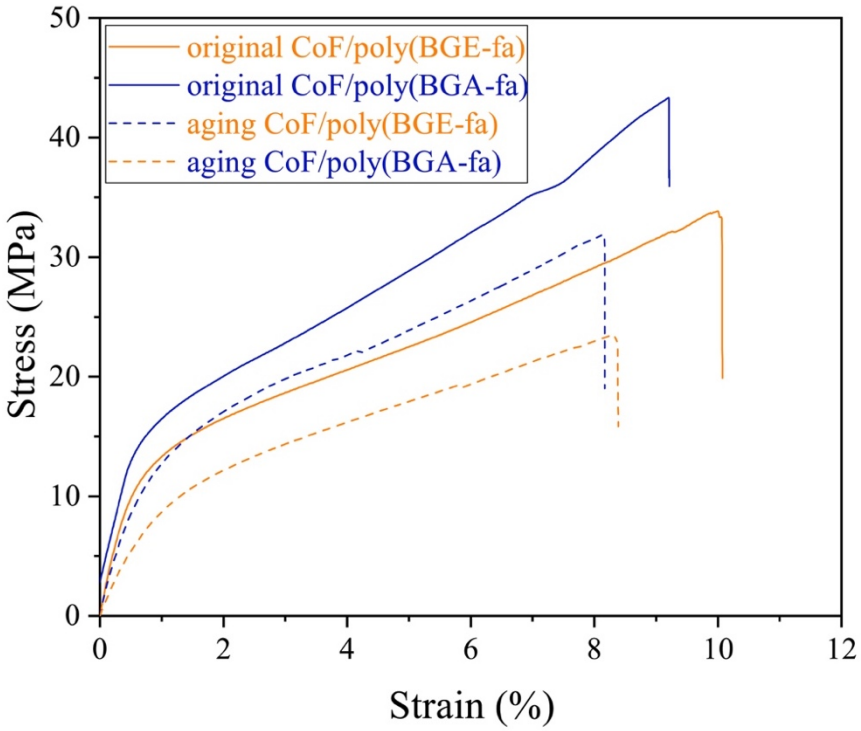


Figure S21 Stress−strain curves of the composites reinforced with cotton fabrics.

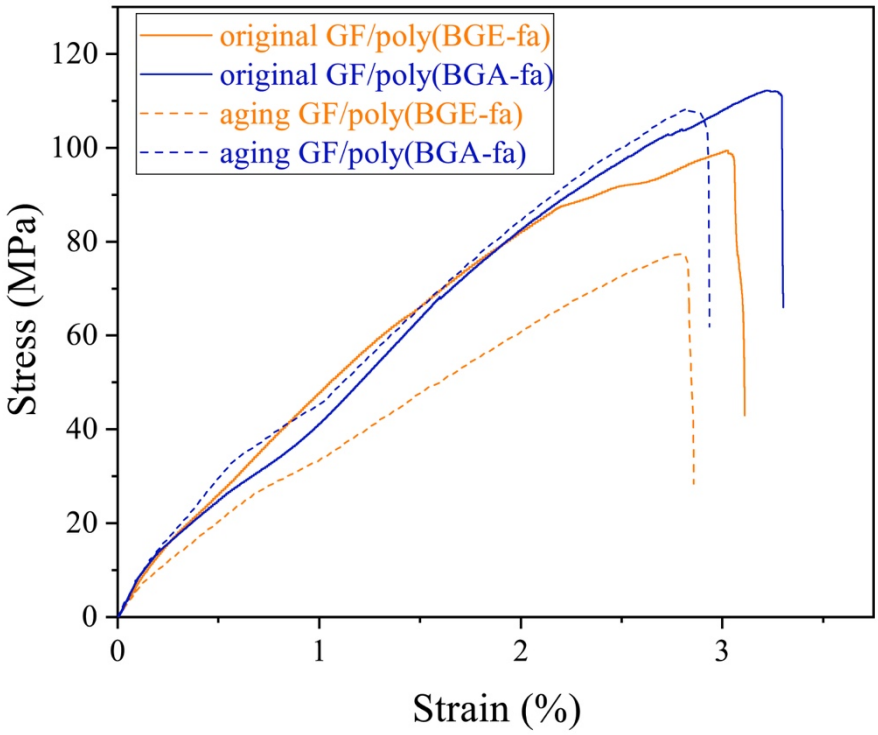


Figure S22 Stress−strain curves of the composites reinforced with glass fiber.