

## Supplementary Information

### **Biobased bismaleimide resins with high renewable carbon content, heat resistance and flame retardancy *via* a multi-functional phosphate from clove oil**

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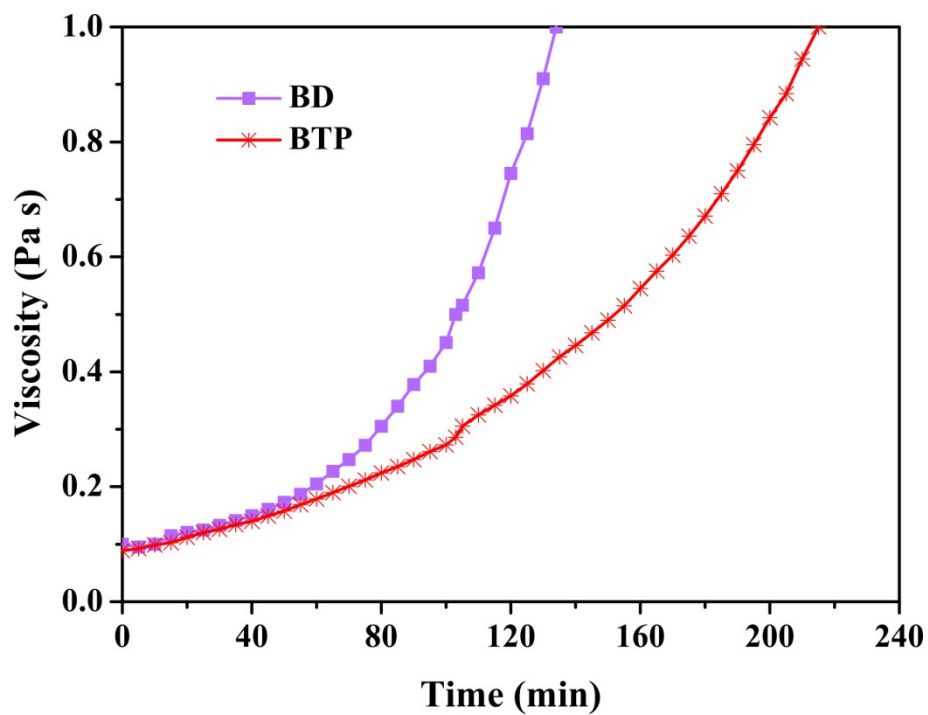


Fig. S1. Viscosity-time curves (at 130 °C) of BD and BTP prepolymers.

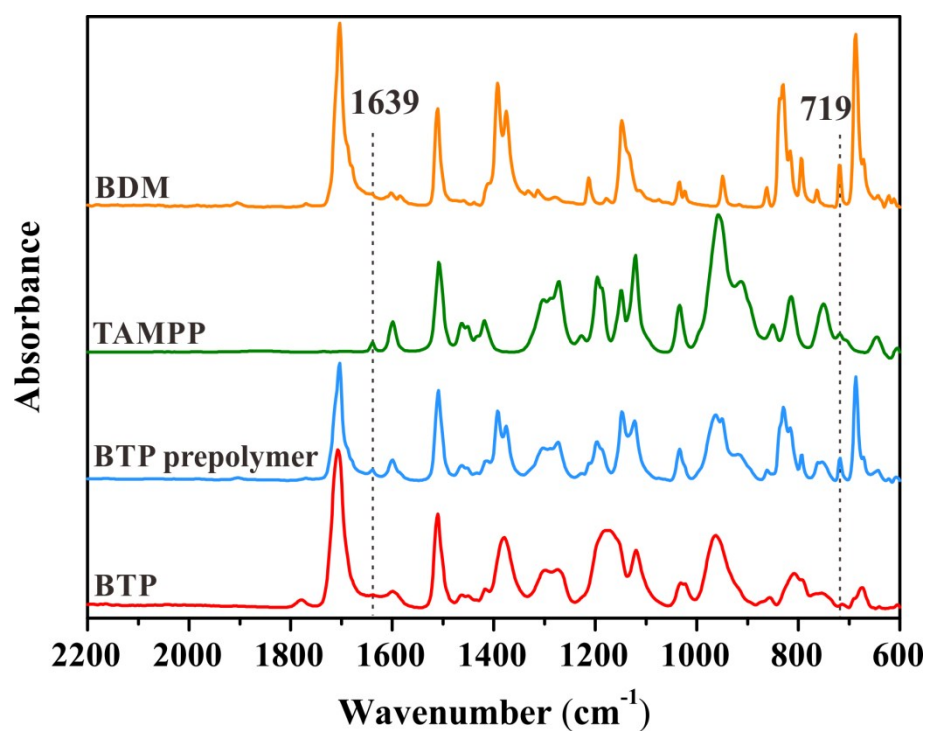
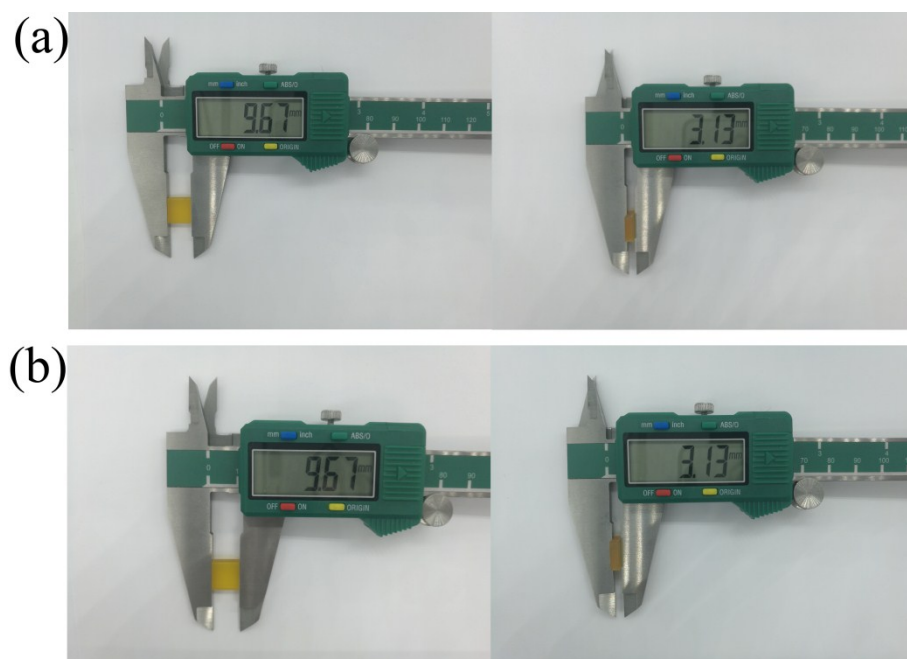
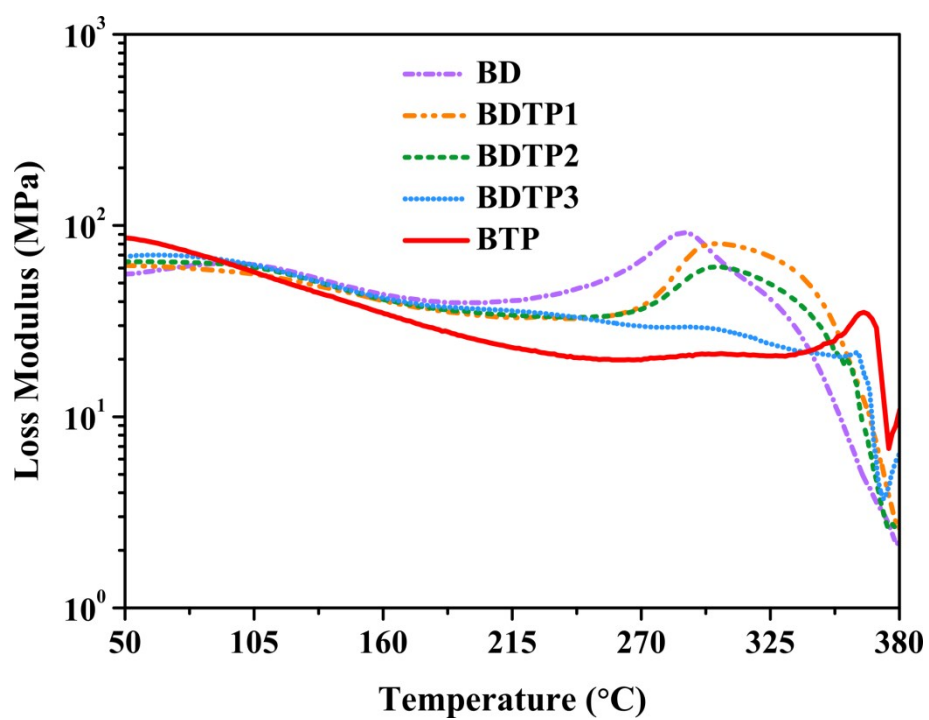


Fig. S2. FTIR spectra of BDM, TAMPP, BTP prepolymer and cured BTP resin.



**Fig. S3.** Digital photos of BTP resins before (a) and after (b) swelling in THF at 25 °C for 24 h.



**Fig. S4.** Loss modulus-temperature plots of BMI resins from DMA tests.

**Table S1** Renewable carbon contents and integrated performances of biobased eugenol derived BMI resins in literature and this work.

BMI resin <sup>a)</sup>	Renewable Carbon Content (%) <sup>b)</sup>	$T_g$ (°C) <sup>c)</sup>	Flexural Strength (MPa)	LOI (%)	UL-94 Level	Decrease degree of PHRR (%)	Decrease degree of THR (%)	Ref
BTP	45.0	>380	133.32	39.6	V-0	50.8	72.9	This work
BMI-HECTP1/1	48.8	256.7	99.09	39	V-0	--	--	[S1]
BMI-HECTP1.5/1	38.8	268.9	100.03	48.4	V-0	--	--	
BMI-HECTP2/1	32.3	273.2	77.77	50.1	V-0	--	--	
BMI-HECTP2.5/1	27.6	272.6	82.32	49.8	V-0	--	--	
BMI-HECTP3/1	24.1	257.6	89.76	48.9	V-0	--	--	
EB11	48.8	256.4	76	--	--	--	--	[S2]
EB12	32.3	345.8	84.5					
EB13	24.1	377.0	75					
BB11	48.8	201.2	14					
BB12	32.3	285.8	57					
BB13	24.1	336.1	26					
NB11	d)	319.3	72					
NB12		343.7	71					
NB13		365.1	73					
EB'11	29.4	357.6	59.1	--	--	--	--	[S3]
EB'12	18.2	373.1	58					
EB'13	13.2	>400	49					
BB'11	29.4	352.8	68.2					
BB'12	18.2	387.9	59					
BB'13	13.2	>400	47					
p(E-pPDA -bMI)1:1	39.2	265	--	--	--	--	--	[S4]
p(E-pPDA -bMI)1:0.8	42.7	240						
p(E-pPDA -bMI)1:0.6	46.9	210						
ABM11	29.4	>350	65.8	--	--	--	--	[S5]
ABM12	18.2	>350	54.1					
ABM13	13.2	>350	59.4					

a) BMI monomer is N,N'-(4,4'-methylenediphenyl) dimaleimide (BDM), BMI resins were obtained by

copolymerizing BDM with allyl compounds.

b) Renewable carbon content (also called biobased content) is assigned as the “amount of biobased carbon in the material or product as a percent of the weight (mass) of the total organic carbon in the product” by the United States Department of Agriculture (USDA).

c)  $T_g$  is determined as the peak of  $\tan \delta$  curve from DMA.

d) The renewable carbon content could not be calculated because the modifier was a blend of two polymers which were derived from both biomass and petrochemical resources.

## References

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