Supporting Information for

Thermally Conductive Anticorrosive Epoxy Nanocomposites with TannicAcid Modified Boron Nitride Nanosheets

Duo Pan,[a] Xiaodong Zhang,[a] Gui Yang,[a] Ying Shang,[a] Fengmei Su,[a,*]

Qian Hu,[b] Rahul Rangrao Patil,[b,c] Hu Liu,[a] Chuntai Liu,[a] and Zhanhu Guo[b,*]

[a] *Key Laboratory of Materials Processing and Mold (Zhengzhou University), Ministry of Education; National Engineering Research Center for Advanced Polymer Processing Technology, Zhengzhou University, Zhengzhou, 450002, China*

[b] *Integrated Composites Laboratory (ICL), Department of Chemical & Biomolecular Engineering, University of Tennessee, Knoxville, TN 37996, USA*

[c] *Agricultural Solutions America (APT), BASF Beaumont Site, Texas, USA.*

[*] correspondence authors: fmsu@zzu.edu.cn (F. Su) and zguo10@utk.edu (Z. Guo)

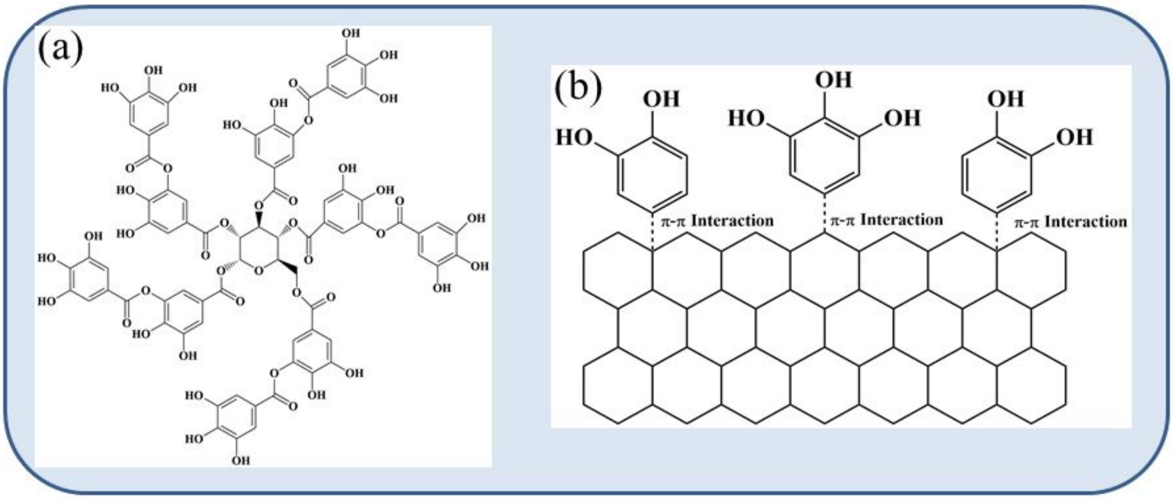

Figure S1. (a) The TA structure and (b) the structure of TA modified BNNSs.

The curing agent 593 is obtained by the addition reaction of diethylene triamine and butyl glycidyl ether. The structure reaction mechanism diagram of synthetic curing agent 593 is shown in Figure S2.

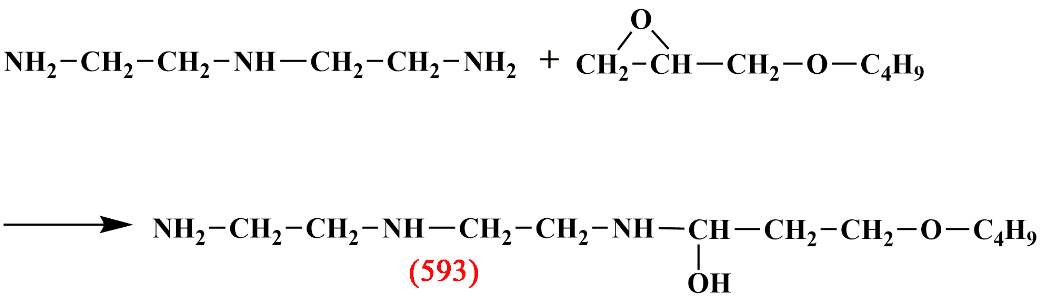

Figure S2. The structure reaction mechanism diagram of synthetic curing agent 593.

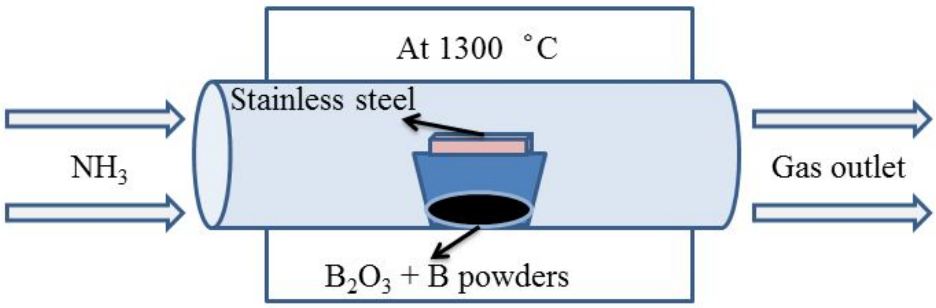

Figure S3. The experimental setup of synthetic BNNSs.

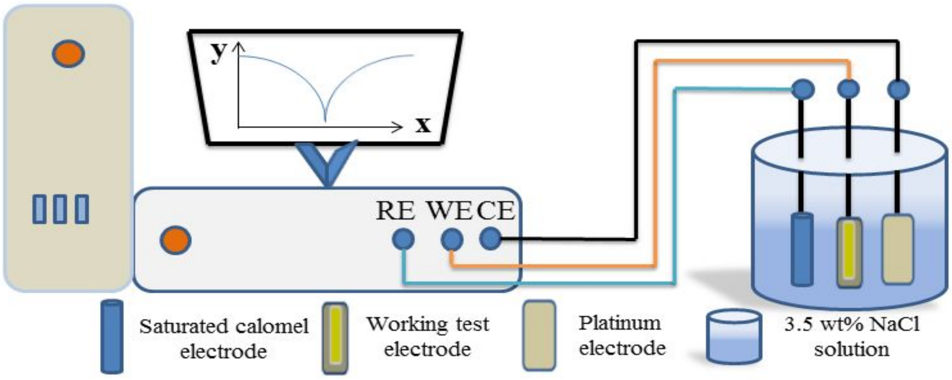

Figure S4. The schematic diagram of electrochemical measurement.

The dispersion of BNNS and M-BNNS was investigated, as shown in Figure S5. Equal amounts of BNNS powder and M-BNNS powder were added into 10 mL of deionized water and absolute ethanol, and dissolved and dispersed by ultrasound for 4 h. After standing for 1 day, compared with M-BNNS solution, unmodified BNNS showed slight delamination in deionized water and absolute ethanol solution. While after standing for 1 month, the unmodified BNNSs were almost completely delaminated in the two solutions. And it is easy to find that the M-BNNS has better dispersion in anhydrous ethanol than in deionized water, and the longer for standing time, the more obvious this distinction effect. This experiment proved the modification success of BNNS from another angle.

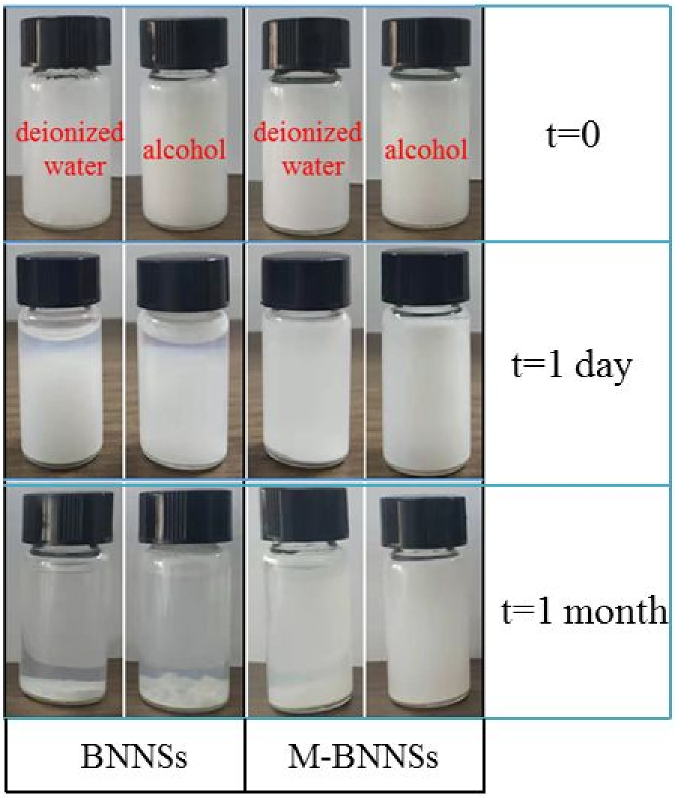

Figure S5. Comparative experiment on the dispersibility of BNNSs and M-BNNSs in deionized water and absolute ethanol.

BNNS@EP composites were poured into customized Teflon molds (with a length, width and height of 3 cm, 1 cm and 2 mm, respectively) for mechanical tensile strength testing. It can be seen from Figure S6 that the tensile strength of M-BNNS@EP composites compared to neat EP increases with the increase of M-BNNS content within a range of 5-15 wt%. However, with the amount of filler continues increase to 20%, the tensile strength of the composite material decreases rapidly. This is because there is a certain agglomeration between the fillers, which destroys the continuity of the EP matrix and increases the internal defects of the composite. More importantly, the tensile strength of 10%M-BNNS@EP (36.1 MPa) is significantly better than that of 10%BNNS@EP (26.7 MPa), which indicates the successful modification of BNNS contributes to the improvement of the mechanical properties of M-BNNS@EP composites.

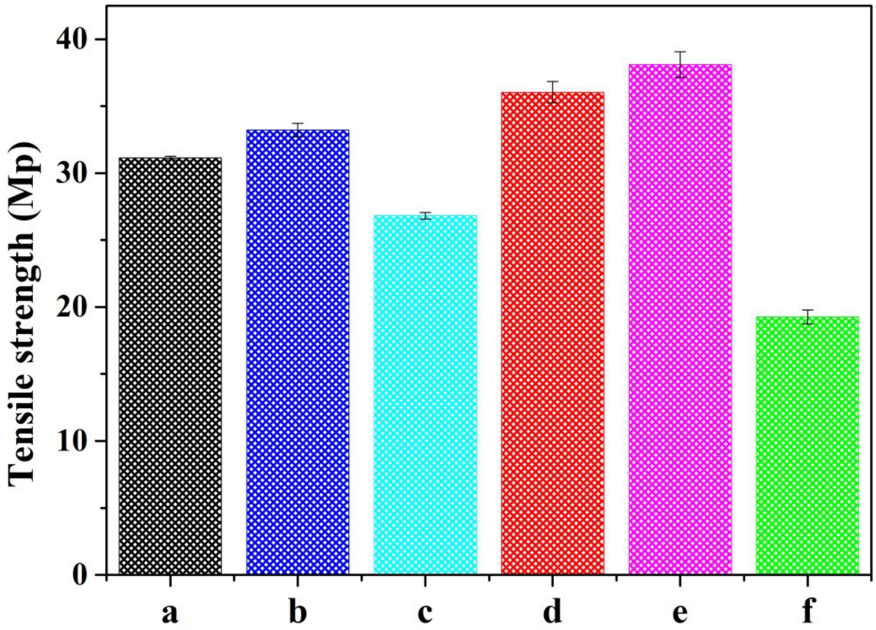

Figure S6. The tensile strength-strain curves of different samples (a: EP, b: 5%M-BNNS@EP, c: 10%BNNS@EP, d: 10%M-BNNS@EP, e: 15%M-BNNS@EP and f: 20%M-BNNS@EP).

Table S1. Thermal conductivity improvement summarizations of the BNNSs/EP composites compared with the neat EP

Samples	λ (W/(m·K))	Improvement, ∆(%)
EP	0.19	/
5%M-BNNS@EP	0.24	5.26
10%BNNS@EP	0.32	6.84
10%M-BNNS@EP	0.41	11.58
15%M-BNNS@EP	0.53	11.93
20%M-BNNS@EP	0.59	10.53

∆ = 100 $(\lambda_C - \lambda_E)/(\varphi_f \cdot \lambda_E)$, where K_C and K_E are thermal conductivities of composites and matrix EP, φ_f is the filler loading.

Table S2. Comparison of the anticorrosion performance of several boron nitride-based composite materials

Samples	Corrosive medium	i_{corr} (A/cm^2)	Ref.
BN/zinc phosphate	Mild steel	3.21×10^{-6}	1
BN films	Cu foil	4.62×10^{-7}	2
BN films	Cu plate	6.94×10^{-6}	3
BN/Cu	Cu foil	2.70×10^{-7}	4
BN/D-ATA[a]	/	2.37×10^{-6}	5
nano-SiO_2/EP	Fe foil	6.33×10^{-6}	6
EP	Carbon steel	1.67×10^{-5}	7
BN/EP	Cold rolled plates	8.05×10^{-7}	This work

a: D-ATA is bifunctional phosphorus-containing triazole derivatives.

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