Electronic Supporting Information (ESI)

A small amount of delaminated Ti_3C_2 flakes to greatly enhance the thermal conductivity of boron nitride papers by assembling the well-designed interface

Xianwu Huang[a] and Peiyi Wu[a,b]*

[a]State Key Laboratory of Molecular Engineering of Polymers, Department of Macromolecular Science, Fudan University, Shanghai 200433, P. R. China

[b]State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Chemistry, Chemical Engineering and Biotechnology, Center for Advanced Low-Dimension Materials, Donghua University, Shanghai 201620, China

E-mail：peiyiwu@fudan.edu.cn

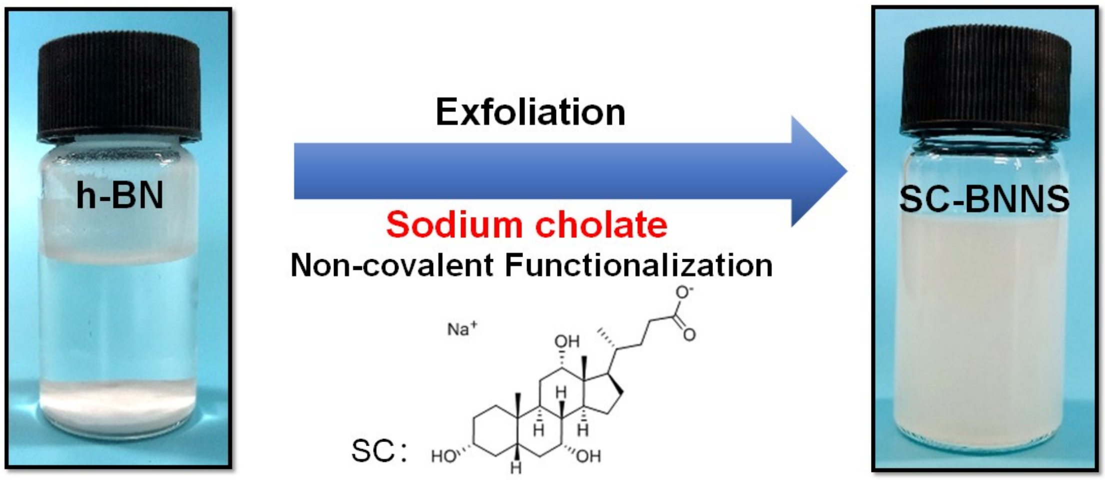

Fig. S1. The illustration of the exfoliation and SC non-covalent functionalization process of BNNS.

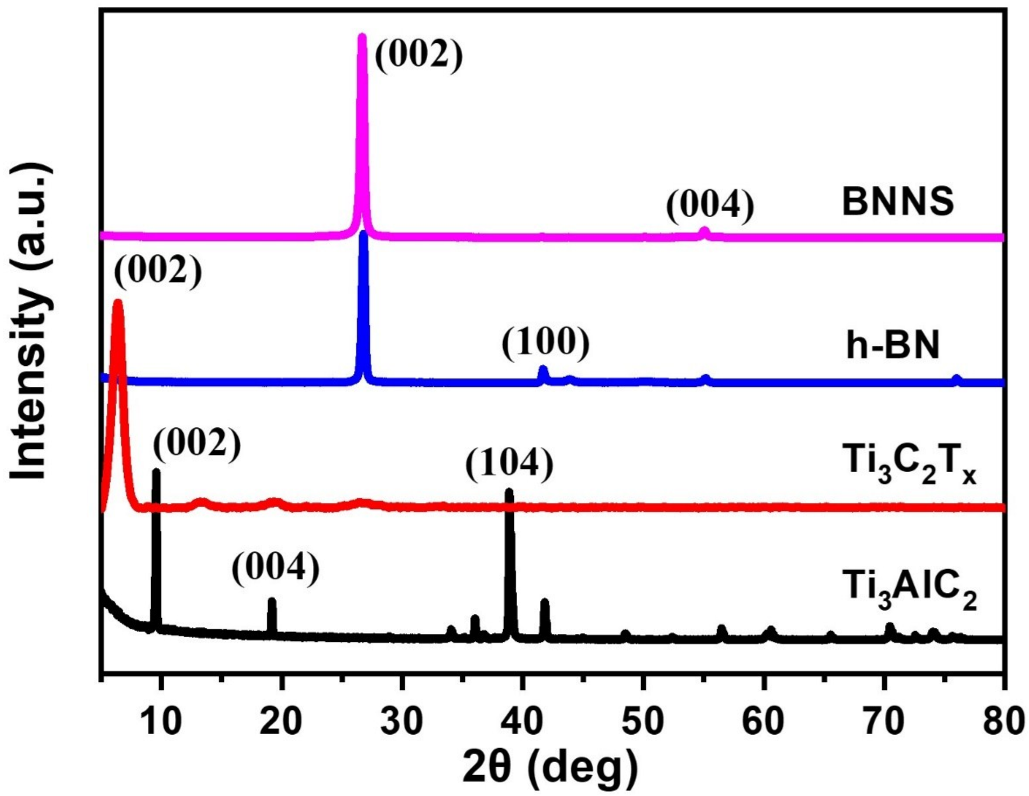

Fig. S2. XRD patterns of BNNS, h-BN, $Ti_3C_2T_x$, and Ti_3AlC_2.

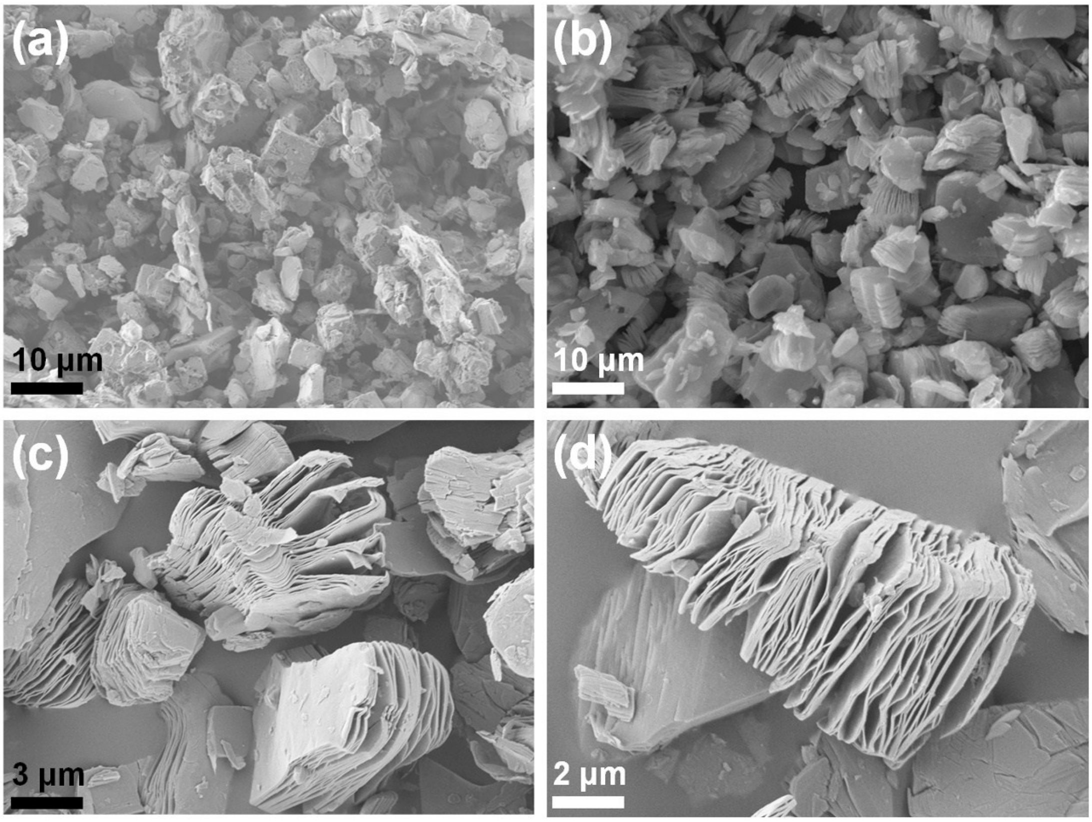

Fig. S3. SEM of MAX (a)before and (b, c, and d) after etching Al atom layers.

Table S1. ζ-potential of exfoliated BNNSs and MXene in DI water.

	BNNSs	MXene
ζ-potential/mV	-20.1	-39.0

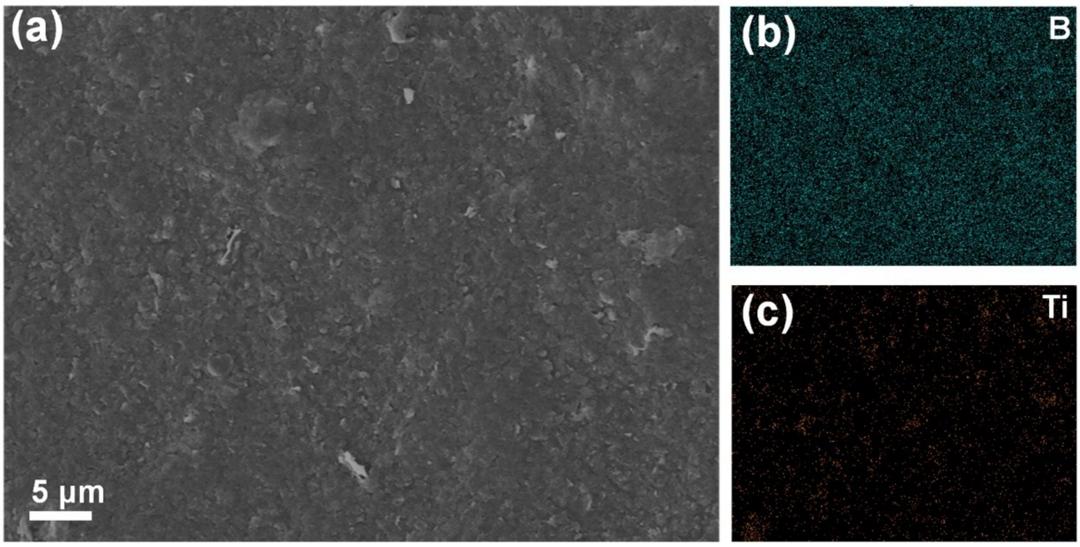

Fig. S4. (a) SEM of the surface of BM-5 film (b, c) and corresponding elemental mappings of B and Ti.

Table S2. ρ, α, c, and calculated **λ** of BNNS/MXene composite films.

Samples	**α/ mm^2 s^{-1}**	**ρ/ g cm^{-3}**	**c/ J g^{-1} K^{-1}**	**λ/ W m^{-1} K^{-1}**
		In-plane		
BM-0	12.81 ± 0.46	1.950	1.08	26.98 ± 0.96
BM-1	15.42 ± 0.61	1.957	1.09	32.89 ± 1.30
BM-5	24.07 ± 0.59	1.963	1.11	52.45 ± 1.29
BM-13	18.96 ± 0.61	1.983	1.16	43.61 ± 1.41
BM-17	14.67 ± 0.33	1.994	1.20	35.10 ± 0.80
BM-25	13.66 ± 0.25	2.016	1.25	34.42 ± 0.62
BM-100	13.43 ± 0.20	2.214	1.09	32.41 ± 0.48
		Out-of-plane		
BM-0	2.25 ± 0.1	1.950	1.08	4.74 ± 0.21
BM-5	1.8 ± 0.08	1.963	1.11	3.92 ± 0.17
BM-100	1.6 ± 0.09	2.214	1.09	3.86 ± 0.22

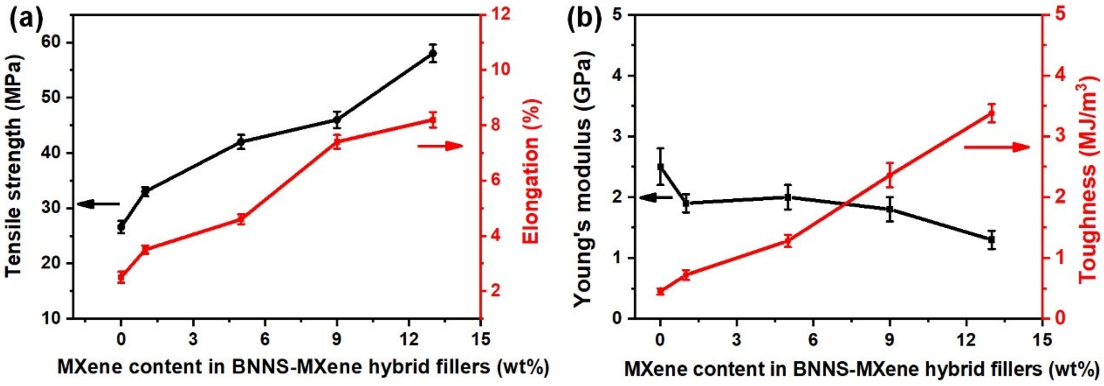

Fig. S5. (a) The tensile strength, elongation, (b) Young's modulus, and toughness of the BM film with different MXene content.

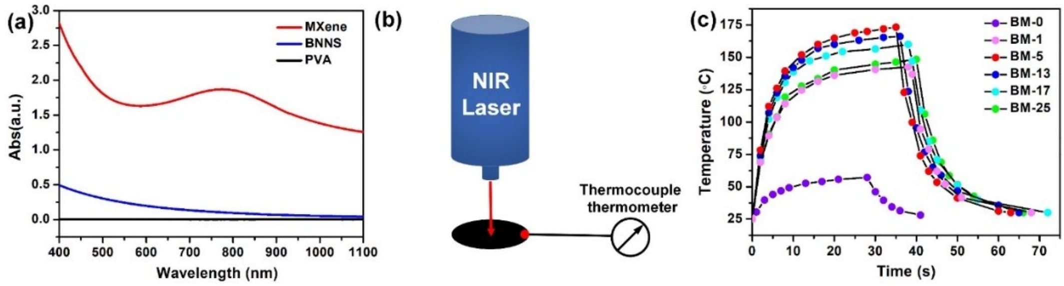

Fig. S6. (a) Ultra violet-visible (UV-Vis) spectrum of MXene, BNNS and PVA in DI water. **(b)** The facile experiment setup of NIR light-to-heat. **(c)** The curve of temperature versus time corresponding to NIR light-to-heat experiment.

Table S3 Comparisons between the TCs and the preparation methods of BNNS/MXene composite film and typical hBN or BNNS-based composites [a]

Matrix	Fillers	Fraction of filler	TC (W m^{-1} K^{-1})	Preparation methods	Year[Ref.]
BNNS	GO	5.0 wt%	29.8	Vacuum filtration	2016[1]
PVA	BNNS	94 wt%	6.9	Vacuum filtration	2015[2]
PVA	BNNS/GO	98.4wt% (BNNS:GO=80:20)	11.9	Vacuum filtration	2017[3]
PVA	BNNS-Ag/SiCNW-Ag	95wt% (BNNS-Ag: SiCNW-Ag=85:10)	21.7	Vacuum filtration	2016[4]
PMMA	BNNS	80 wt%	11	Evaporation	2016[5]
EP	BNNS	44 vol%	9.0	Evaporation	2017[6]
EP	BNNS-Ag	25.1 vol%	12.6	Evaporation	2016[7]
CNF	BNNS	70 wt%	30.3	Vacuum filtration	2017[8]
PS	BNNS	13.4 vol%	8.0	Hot pressing	2017[9]
TPU	BNNS	95 wt%	50.3	Hot pressing	2018[10]
/	BNNS	100 wt%	51.1	Vacuum filtration	2017[11]
PVA	BNNS-PDA	70 wt%	24.6	Vacuum filtration	2019[12]
BNNS	Graphene	5 wt%	63.5	Vacuum filtration	2019[13]
PVA	BNNS-MXene	80wt% (BNNS:MXene=95:5)	52.4	Vacuum filtration	This work

[a] BNNS represents boron nitride nanosheets; BNNS-Ag means boron nitride nanosheets decorated with Ag nanoparticles; PVA represents poly (vinyl alcohol); SiCNW represents silicon carbide nanowires; PMMA represents polymethyl methacrylate; EP represents epoxy resin; CNF represents cellulose nanofiber; PS represents polystyrene; TPU represents thermoplastic polyurethane; PBI represents Polybenzimidazole; PDA represents polydopamine.

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