

Supporting Information:

Enhanced Thermal Conductivity in Immiscible Polyimide Blend Composites with Needle-Shaped ZnO Particles

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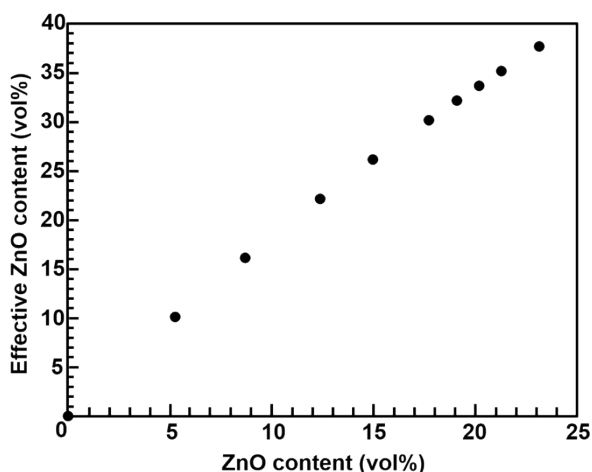


Figure S1 Relation between the loaded ZnO content and the effective ZnO content in PI blend composite films. The dual-phase VDP structure shown in Fig. 1 (the molar ratio of TF and SD phases is 1:1) is assumed to estimate the effective ZnO content.

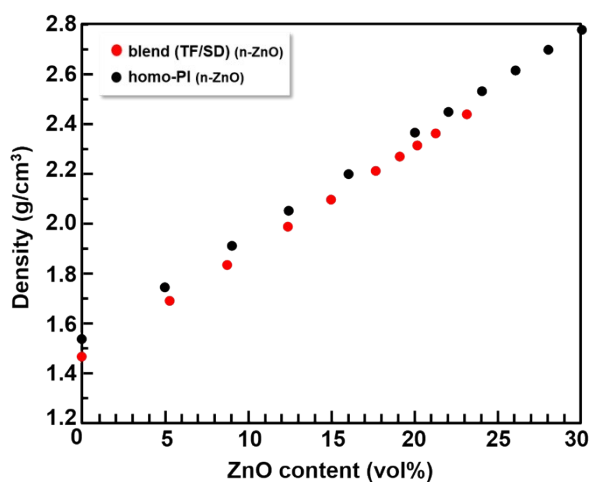


Figure S2 Weight density of homo-PI and PI blend composite films calculated based on Eq. 2 as a function of ZnO content.

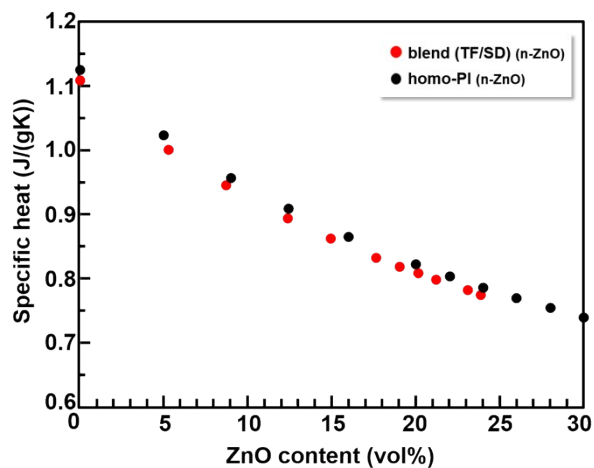


Figure S3 Specific heats of homo-PI and PI blend composite films calculated based on Eq. 3 with various n-ZnO contents.

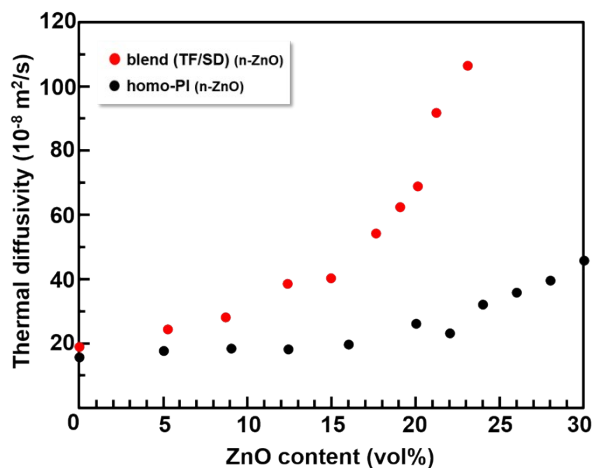


Figure S4 Experimental thermal diffusivity of homo-PI and PI blend composite films with various n-ZnO contents.

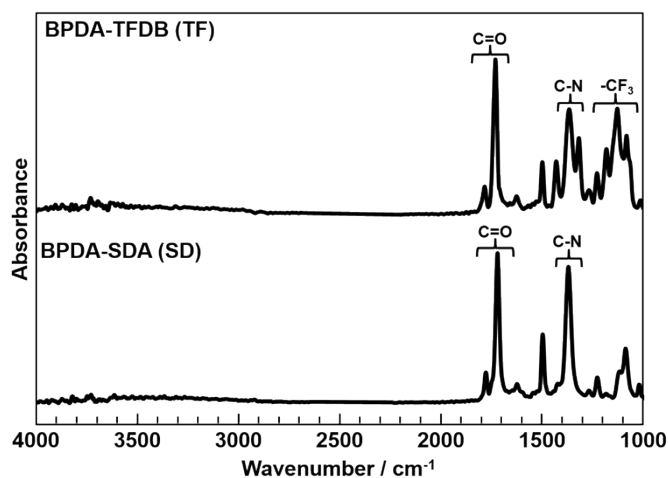


Figure S5 ATR FT-IR spectra of SD and TF homo-PI films cured at 350 °C.

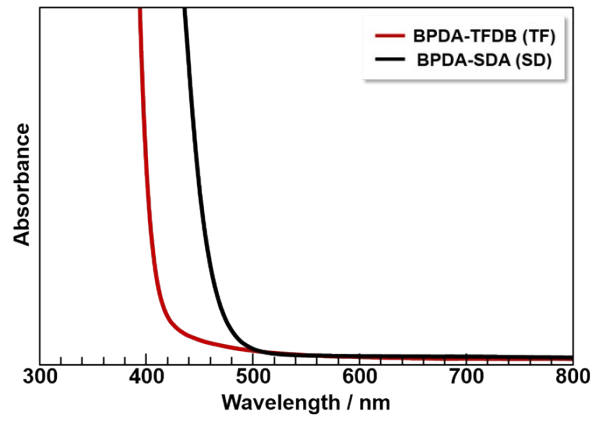


Figure S6 UV-Vis absorption spectra of SD and TF films cured at 350 °C. UV-vis absorption spectra of the films were acquired with Hitachi U-3500 spectrophotometer.

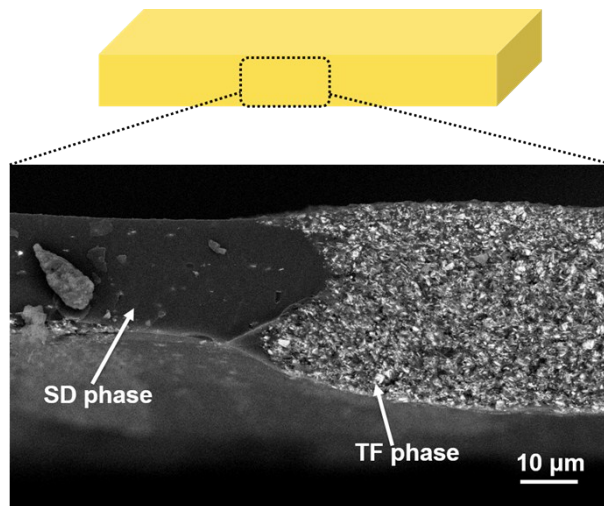


Figure S7 Magnified cross-sectional FE-SEM image of VDP structure (filler content : 21 vol%).

Table S1 n-ZnO content in the composite films ϕ_p , effective n-ZnO content in the composite films ϕ_{ep} , thermal conductivity λ , density ρ , specific heat C_p , and thermal diffusivity D_{\perp} of n-ZnO/PI composite films.

Composite Films	ϕ_p [vol%]	ϕ_{ep} [vol%]	λ [W/(mK)]	ρ [g/cm ³]	C_p [J/g·K]	D_{\perp} [10 ⁻⁸ m ² /s]
homo-PI-0	0	0	0.26	1.53	1.13	15.3
homo-PI-5	5	5	0.31	1.74	1.02	17.2
homo-PI-9	9	9	0.33	1.90	0.96	18.0
homo-PI-12	12.4	12.4	0.33	2.04	0.91	17.8
homo-PI-16	16	16	0.37	2.19	0.87	19.3
homo-PI-20	20	20	0.50	2.44	0.82	25.7
homo-PI-22	22	22	0.45	2.36	0.80	22.7
homo-PI-24	24	24	0.62	2.53	0.79	31.4
homo-PI-26	26	26	0.71	2.61	0.77	35.2
homo-PI-28	28	28	0.79	2.69	0.76	38.9
homo-PI-30	30	30	0.93	2.78	0.74	45.1
blend-0	0	0	0.30	1.46	1.11	18.5
blend-5	5.3	10	0.40	1.68	1.00	24.0
blend-9	8.7	16	0.47	1.82	0.95	27.6
blend-12	12.4	22	0.67	1.98	0.89	37.9
blend-15	14.9	26	0.72	2.09	0.86	39.7
blend-18	17.6	30	0.98	2.20	0.83	53.4
blend-19	19.0	33	1.13	2.26	0.82	61.4
blend-20	20.1	33.5	1.27	2.31	0.81	67.9
blend-21	21.2	35	1.70	2.36	0.80	90.5
blend-23	23.1	37.5	2.00	2.43	0.78	105