

Supporting Information

Reducing the Coefficient of Thermal Expansion of Polyimide Films in Microelectronics Processing Using ZnS Particles at Low Concentrations

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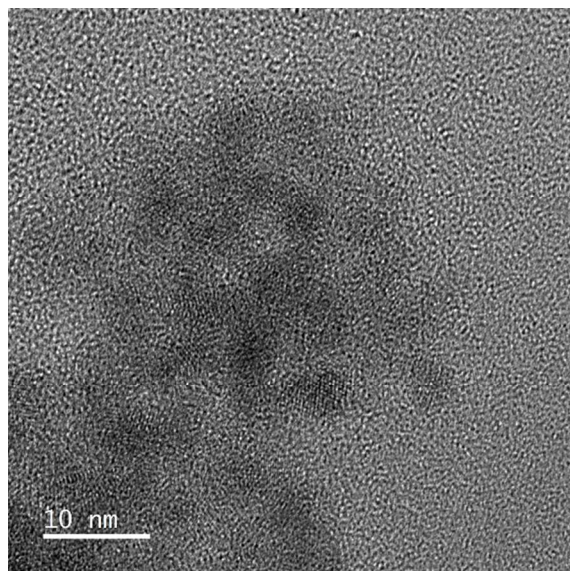


Figure S1. TEM image of the ZnS particles in high-resolution

Table S1. Properties of PI nanocomposites at 15 wt% filler concentration

	Bare PI	SiO ₂	ZrW ₂ O ₈	Unmodified ZnS	Modified ZnS
Thermal diffusivity^a (mm²/s)	0.172	0.176	0.179	0.200	0.217
Density^b (g/cm³)	1.40	1.59	1.95	1.80	1.80
Specific heat capacity^b (J/g·°C)	1.13	1.06	1.02	1.03	1.03
Thermal conductivity^c (W/m·K)	0.272	0.297	0.356	0.370	0.402

^aThermal diffusivity was determined by experiments; ^bDensity and Specific heat capacity values were estimated based on the rule of mixture; ^cThermal conductivity was calculated from the definition of the thermal diffusivity.