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ADVANCED MATERIALS INTERFACES

Supporting Information

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Interfacial Thermal Conductance between Mechanically Exfoliated Black Phosphorus and SiO_x: Effect of Thickness and Temperature

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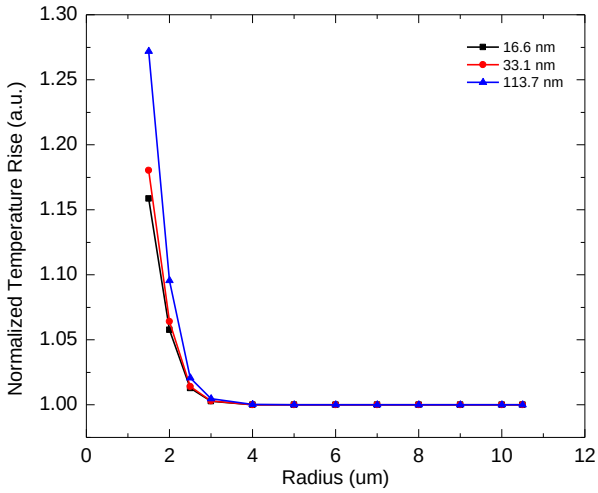

Figure S1. Evaluation of sample lateral size effect on the temperature rise of 16.6, 33.1, 113.7-nm thick BP flakes. The shape of BP flake is simplified to a circular one, and their interface thermal resistance is set as 2.8×10^{-8} m^2KW^{-1} (a value closed to their measured thermal resistance at 293 K) in the numerical calculations. Normalized by the temperature rise of BP flake with a radius of 10 μm, the normalized temperature rise of BP flake against sample radius can be obtained. Obviously, the normalized temperature rise drops dramatically when the radius of BP increases from 1.5 to 2.5 μm, and it becomes saturated when the radius reaches 3 μm. Apparently, it indicates that the size effect disappears when the radius of BP flake is larger than 3 μm. The real BP flakes in our Raman measurements have areas larger than 5 μm×5 μm. Thus, the lateral size effect on the measurement of interfacial thermal conductance *G* can be neglected.

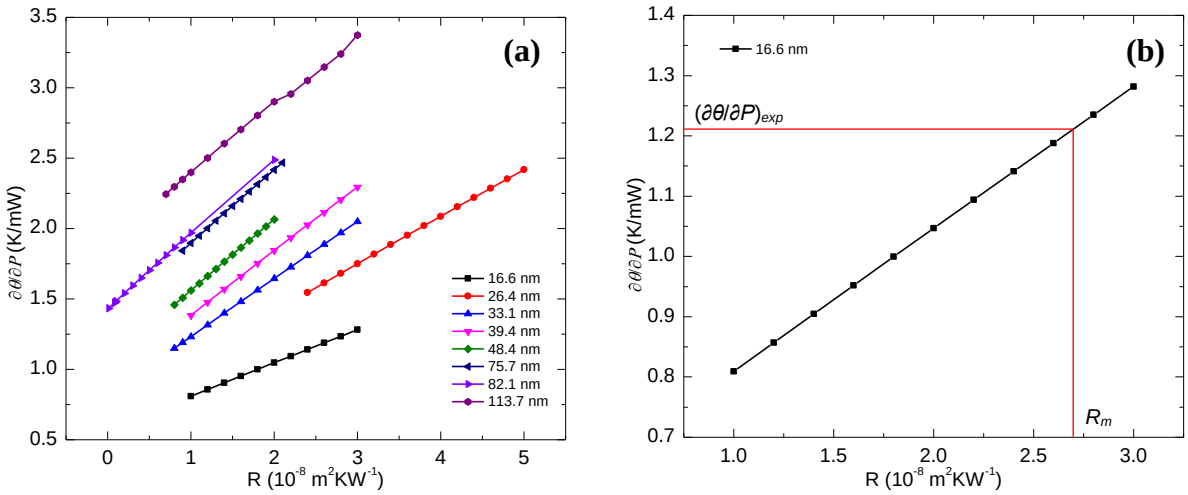

Figure S2. (a) Numerically calculated $\partial\theta/\partial P$ as a function of thermal resistance R for different BP flakes. For all BP flakes, $\partial\theta/\partial P$ increases as the increase of R. At the same R, thick samples have a larger $\partial\theta/\partial P$, indicating a larger temperature rise under the irradiation of a unit laser power. (b) The interpolation of experimental $(\partial\theta/\partial P)_{exp}$ into numerically calculated R-$\partial\theta/\partial P$ for extracting true R_m.

Table S1. The measured thermal resistance *R* of different BP flakes under the temperature range of 223 to 293 K. Obviously, the thermal resistance *R* at 293 K is larger than that at 223 K.

T (K)	Thermal Resistance ($\times 10^{-8}$ m^2KW^{-1})							
	16.6 nm	26.4 nm	33.1 nm	39.4 nm	48.4 nm	75.7 nm	82.1 nm	113.7 nm
293	2.77	4.60	2.84	2.43	1.94	1.75	0.877	2.86
283	2.46	4.02	1.85	2.47	1.88	2.05	0.857	2.11
273	2.18	3.95	2.72	2.75	1.78	1.88	0.710	2.18
263	1.83	3.76	1.87	1.82	1.69	1.88	0.586	1.26
253	1.62	3.29	1.57	2.27	1.45	1.20	0.346	1.43
243	1.07	3.11	2.14	1.89	1.24	1.13	0.306	0.995
233	1.41	2.62	0.103	1.70	0.927	0.998	-	0.791
223	1.21	2.60	0.816	1.17	0.821	0.978	0.184	1.06