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Optical Properties and Optimization of LaB_6 Thin Films for Photothermal Applications

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Table S1. Substrate temperature, thickness, rate of deposition, surface roughness, particle size, carrier concentration and Hall mobility of various LaB_6 samples

Substrate temperature [°C]	Deposition rate [Å/sec]	Thickness [nm]	Average Surface roughness [nm]	Mobility [cm²/V·s]	Carrier concentration [1/cm³]	Particle Size [nm]
300 °C	2.5	115	2.82	---	---	---
400 °C	2.5	122	3.85	3.36	1.72E22	26.2
500 °C	2.5	100	3.90	6.72	1.42E22	25.4
600 °C	2.5	120	3.80	6.98	1.56E22	26.7
700 °C	2.5	105	3.38	9.27	1.39E22	29.7
770 °C (770 °C-1)	2.5	118	7.51	10.06	1.82E22	40.6
770 °C (770 °C-2)	2.5	124	8.62	10.27	1.06E22	41.0
770 °C (770 °C-3)	3.5	110	7.20	10.40	1.45E22	40.1
800 °C	2.5	100	6.10	7.83	1.03E22	39.6

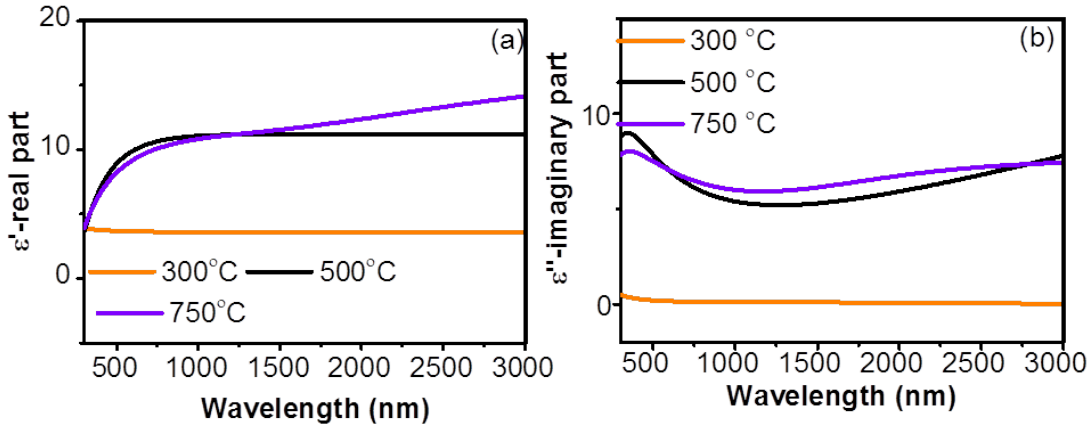


Fig. S2. Complex permittivities of LaB_6 films (deposited using PLD) (a) real and (b) imaginary parts. The LaB_6 films were deposited using similar sintered polycrystalline LaB_6 target used for e-beam deposition with various substrate temperatures.

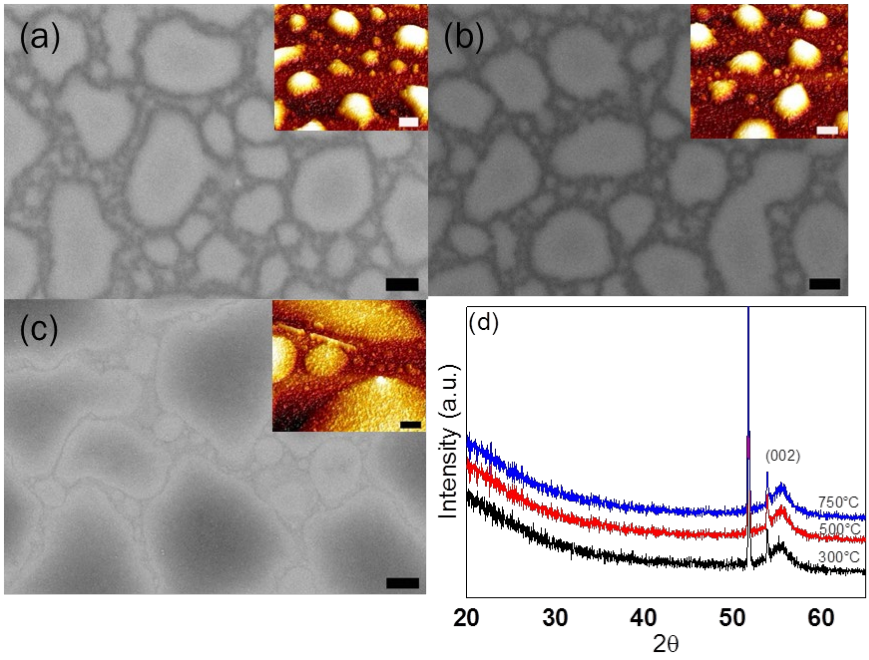


Fig. S3. SEM images of LaB_6 with different substrate temperatures deposited using PLD at (a) 300 °C (b) 500 °C, and (c) 750 °C with corresponding AFM images in the inset. The scale bar of SEM and AFM images is 100 nm.

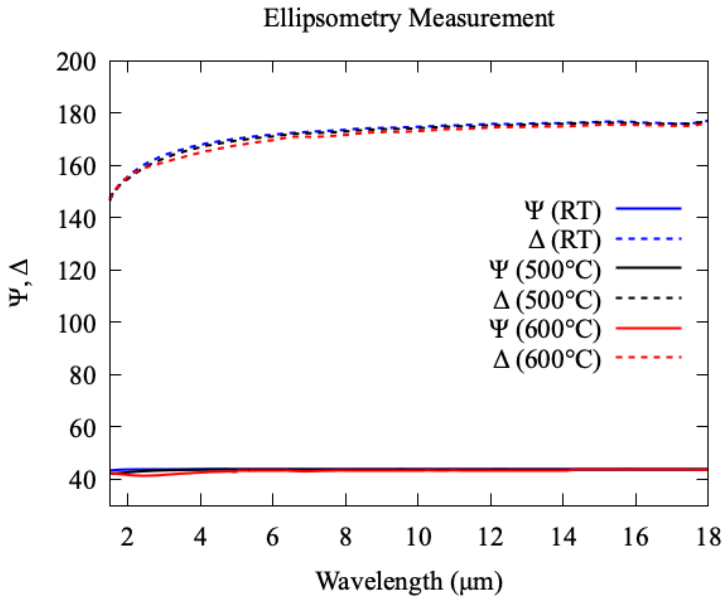


Fig. S4. Ellipsometry raw data taken from a LaB_6 film grown at 770 ℃, before and after initial annealing cycles at 500 ℃ and at 600 ℃ High thermal stability in air was confirmed.

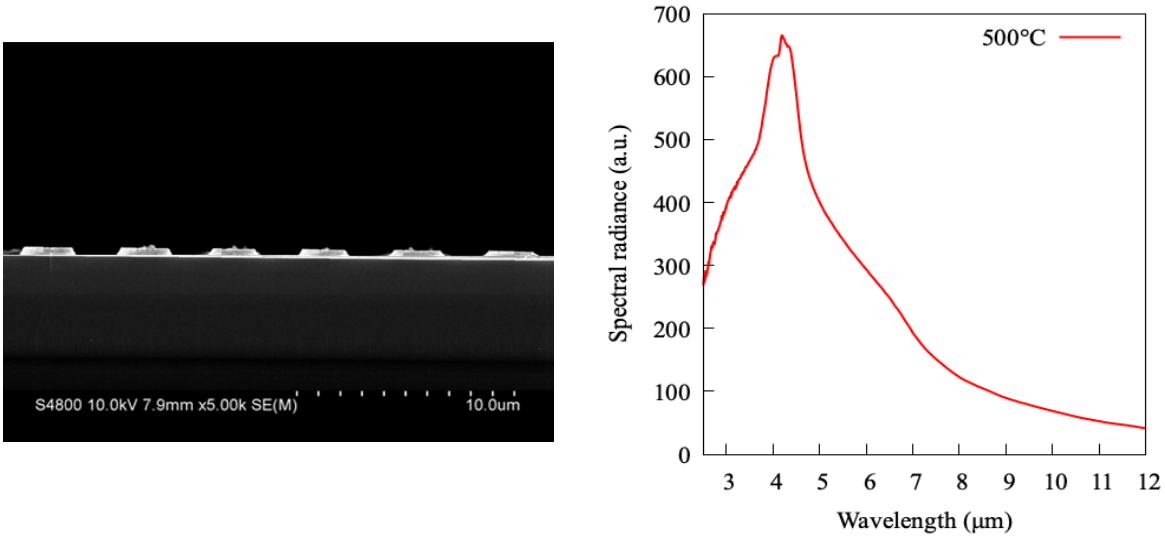


Fig. S5. Spectroscopic infrared emitter fabricated using the epitaxial LaB_6 film grown at 770 ℃ followed by photolithography and CF_4 dry etching. As a preliminary experiment, an emission spectrum was measured from the fabricated emitter by heating it at 500 ℃. This emitter design is based on the grating-based structure discussed in Figure 6 (d).