

Spectrally Selective Ultrahigh-Temperature Thermal Emitter with Lanthanum Hexaboride: Operating Temperature Surpassing 1200°C

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Lanthanum hexaboride (LaB₆)-based refractory spectrally selective thermal emitter is proposed, fabricated, and characterized at high temperature in both vacuum and ambient air. The thermal emission resonantly enhanced by a planar Gires-Tournois resonator exhibits an extremely narrow full width at half maximum of ~62 nm. Owing to the high refractory properties of lanthanum hexaboride and the effective structural design, the proposed emitter sustains excellent optical characteristic stability and resistance to oxidation at elevated temperature. The emissive and refractory performance at high temperature of the emitter using lanthanum hexaboride are investigated and compared to those using other refractory metals including tungsten, molybdenum and tantalum to access their viability for robust high-temperature spectroscopic infrared heaters for the applications in thermophotovoltaics as well as in drying furnaces.

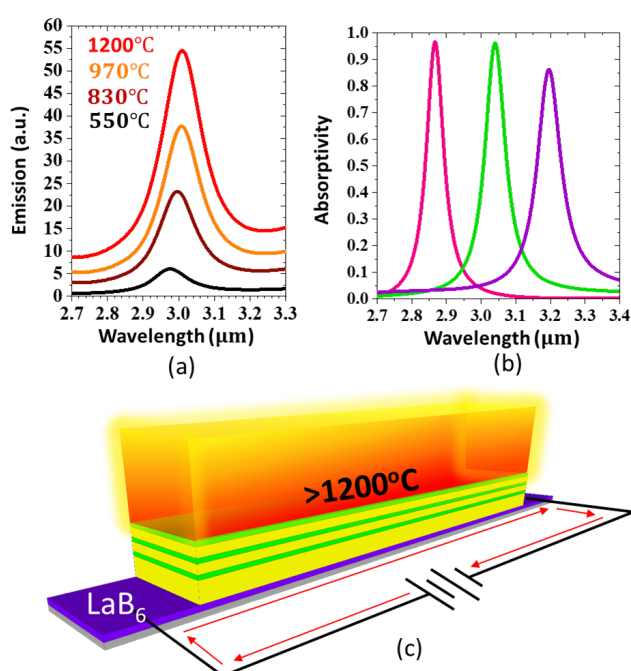


Figure 1. (a) Measured thermal emission at high temperature of Gires-Tournois resonator based spectrally selective thermal emitter using LaB₆ as bottom reflector. (b) Absorptivities of the thermal emitters are tuned by changing the thickness of the Gires-Tournois cavity. (c) The schematic illustration of the thermal emitter.