UV Emission of Yb^{2+} in SrB_4O_7 for Highly Sensitive Optical Thermometry Enabled by Multiple Linear Regression

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Optical thermometry is a modern, non-contact technique for temperature measurement, whose performance is strongly dependent on the choice of thermometric parameters. The unique luminescence of divalent lanthanide ions provides a promising route to significantly enhance the sensitivity of optical temperature sensors.[1,2] Here, we report a luminescent thermometer based on the rarely observed UV emission of Yb^{2+}. Yb^{2+} ions were successfully incorporated into the SrB_4O_7 host, which exhibits excellent thermal stability over a wide temperature range of ≈80–420 K. Under thermal stimulation, the material shows pronounced luminescence modulation, including emission enhancement and spectral shifts toward both higher and lower energies depending on temperature. These behaviors originate from thermally activated population redistribution within the excited $4f^{13}5d^1$ electronic configuration of Yb^{2+}, resulting in distinct temperature responses across multiple relaxation channels. To fully exploit these multidimensional luminescence characteristics, a multiple linear regression (MLR) strategy is employed to integrate different thermometric parameters, leading to a substantial improvement in temperature sensitivity compared with single-parameter methods.[3] This work provides a general framework for extracting temperature information from luminescence dynamics in lanthanide-doped phosphors, offering a strategy for designing high-performance optical thermometers.

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