Molecular Tagging Thermometry with Adjustable Temperature Sensitivity

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Abstract
We report recent advances in the development of Molecular Tagging Thermometry (MTT). The temperature dependence of laser induced phosphorescence of the triplex (1-BrNp·Gβ-CD·ROH) was used to conduct temperature measurements in liquid. The temperature sensitivity of phosphorescence intensity is adjustable by changing the time delay between the laser excitation pulse and the acquisition of phosphorescence emission. With a fixed phosphorescence integration time of 1ms, the temperature sensitivity of the measured intensity varies in the range 7.8% K⁻¹ and 21.5% K⁻¹ at 25 °C as the time delay between laser excitation and phosphorescence acquisition changes from 1 ms to 7 ms. This temperature sensitivity is much higher than most fluorescent dyes used in the past (e.g. about 2.0% K⁻¹ for Rhodamine B). The implementation and application of the new technique are demonstrated by conducting temperature measurements in the wake of a heated cylinder.

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