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**Temperature imaging in fluid flows with sub-C precision using Bi-doped phosphor particles and a single low-frame rate camera**[1] CHRISTOPHER ABRAM, IRIN WILSON PANJIKKARAN, Otto-von-Guericke Universitt Magdeburg, Germany, SIMON NNALUE OGUGUA, University of the Free State, Bloemfontein, South Africa , BENOIT FOND, Otto-von-Guericke Universitt Magdeburg, Germany — Study of coupled fluid mechanics, heat transfer and chemical processes require sensitive temperature measurements that reveal the structure and dynamics of the fluid flow. Temperature imaging using the laser-induced photoluminescence of inorganic phosphor particles is an attractive approach as it combines both the high resolution of laser induced fluorescence techniques and particle tracers that are inert, independent of the fluid chemical composition and pressure, and suitable for joint velocity measurement. Until now the temperature precision has been limited to a few C due to the low temperature sensitivity of measurement approach and phosphor. In this study, we synthesised $ScVO_4$:$Bi^{3+}$ particles whose s luminescence lifetime is very sensitive temperature and can be exploited using a single low frame rate interline transfer camera to perform rapid-lifetime temperature imaging. The ratio of both frames yields a temperature sensitivity of 3-6%/K over the 20-60C range. A demonstration thermal mixing experiment indicates a single shot single pixel temperature precision better than 0.4C at a resolution of 400 m. This simple single-camera approach is ideally suited to the temporally and spatially resolved study of complex thermal convection phenomena.

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