Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Dual-tracer laser-induced fluorescence thermometry in microchannels[1] MYEONGSUB KIM, MINAMI YODA, Georgia Institute of Technology — Laser-induced fluorescence (LIF) thermometry measures liquid temperatures based on changes in fluorescence intensity. In dual-tracer or ratiometric LIF thermometry, liquid temperatures are based on the ratio of the fluorescent signals from two different fluorophores, since this ratio is independent of changes in fluorescence intensity due to variations in the excitation. Recently, a dual-tracer LIF technique using two species with opposite temperature sensitivities, fluorescein 27 and Kiton Red (sulforhodamine B), excited at 532 nm has been reported with temperature sensitivities as great as 7% per °C [Sutton *et al.* (2008) *Exp. Fluids* DOI 10.1007/s00348-008-0506-4]. We describe here a similar technique using fluorescein and sulforhodamine B, which have intensities that increase by 2.2% and decrease by 1.3%, respectively, per °C when volumetrically illuminated at 514 nm. The ratio of these two signals gives temperature sensitivities as great as 9% per °C. This LIF technique is used to measure temperature distributions in water flowing through a 500 μm × 1000 μm polydimethylsiloxane (PDMS) microchannel covered with a glass lid with localized heating to create temperature gradients up to about 15 °C /mm. The results are compared with FLUENT predictions.

[1]Sponsored by NSF and Sandia National Laboratories

Minami Yoda
Georgia Institute of Technology

Date submitted: 31 Jul 2008 Electronic form version 1.4