

Abstract Submitted  
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**Lifetime Based Temperature and Velocity Measurement using High-Speed Camera and Temperature Sensitive Particles** SATOSHI SOMEYA, MITSUNORI UCHIDA, KAORU TOMINAGA, KEIKO ISHII, YAN-RONG LI, KOJI OKAMOTO, Univ. of Tokyo — A simultaneous measurement technique of velocity and temperature distribution in a fluid flow was developed. Particle image velocimetry (PIV) was combined with a lifetime based scalar measurement technique. A measurement method based on the luminescent lifetime is appropriate for detecting the transient temperature field. Developed method needs a high speed camera, a laser (one excitation wave length) and temperature sensitive particles (TSParticles). The luminescence from TSParticles doped with EuTTA was detected by the high speed camera, which was not equipped with any image intensifier, at 15000 frames per second. Imaging at the high frame rate has a possibility to carry out PIV with a wide dynamic range. A decay of luminescent intensity was detected in detail. The decay curves at various temperature conditions were fitted well to exponential functions, from which the decay constant at each temperature was obtained. The proposed technique was applied to measure the temperature and the velocity field in a natural convection driven by Marangoni force and by buoyancy in a rectangular tank. The accuracy of the temperature measurement of the proposed technique was  $\pm 0.5^{\circ}\text{C}$ .

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