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Infrared quantum dots as liquid temperature tracers for imaging through silicon[1] MYEONGSUB KIM, MINAMI YODA[2], Georgia Institute of Technology — Although a number of optical thermometry techniques estimate fluid temperature fields from changes in the lifetime or intensity of the emissions from fluorescent or phosphorescent species, the majority of these techniques rely on imaging optical signals at visible wavelengths. Silicon (Si), commonly used in microelectronics and microelectromechanical systems (MEMS), is however opaque at these wavelengths, and only becomes partially transparent at near-infrared (IR) wavelengths above $\sim$1.2 μm. Given the lack of fluorescent species with emissions in the near-IR, colloidal nanocrystals, or "quantum dots" (QD), of lead sulfide overcoated with cadmium sulfide using a new process with a diameter of 5.7 nm were investigated as temperature tracers. The emissions around 1.35 μm from these PbS/CdS QD suspended in toluene at an absorbance of 0.45 were found to decrease by about 0.5% per $^\circ$C increase in the suspension temperature T for T = 20-60 $^\circ$C with a standard deviation that gave an uncertainty in T of $\sim$0.3 $^\circ$C. The overcoating greatly improves the stability of the QD, and the temperature response of these tracers was consistent for suspended samples stored up to 103 days under nitrogen as well as up to 1 day under air.

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