

# Chapter 41

## 3D Micro-printing of Optical Temperature Probes

Andreas Wickberg, Jonathan B. Mueller, Yatin J. Mange, Thomas Nann,  
and Martin Wegener

**Abstract** We present printable optical temperature probes to monitor the temperature with a spatial precision on the micrometer scale. Our approach is based on the temperature-dependent upconversion fluorescence from NaYF<sub>4</sub>:Yb<sup>3+</sup>, Er<sup>3+</sup> co-doped nanocrystals. These nanoparticles are dispersed in a standard photoresist for direct laser writing, allowing for spatially resolved micro-printing of single or multiple probe spots. For demonstration, we decapsulate a fully operational integrated circuit and print temperature probes directly on the semiconductor chip to monitor its local heating. The printability of the probes facilitates an easy integration into diverse systems, especially when aiming at integrated optics or lab-on-a-chip systems.

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A. Wickberg (✉) • J.B. Mueller • M. Wegener  
Institute of Applied Physics, Karlsruhe Institute of Technology (KIT), 76128 Karlsruhe, Germany  
e-mail: [andreas.wickberg@kit.edu](mailto:andreas.wickberg@kit.edu)

Y.J. Mange • T. Nann  
Ian Wark Research Institute, University of South Australia, Adelaide, SA 5095, Australia

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