

Abstract Submitted
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Fabrication of Gold-coated 3-D Woodpile Structures for Mid-IR Thermal Emitters¹ SHENGKAI LI, AMIR MORIDANI, ROHIT KOTHARI, JAE-HWANG LEE, JAMES WATKINS, Univ of Mass - Amherst — 3-D metallic woodpile nanostructures possess enhancements in thermal radiation that are both wavelength and polarization specific and are promising for thermal-optical devices for various applications including thermal photovoltaics, self-cooling devices, and chemical and bio-sensors. However, current fabrication techniques for such structures are limited by slow speed, small area capability, the need for expensive facilities and, in general, are not suitable for high-throughput mass production. Here we demonstrate a new strategy for the fabrication of 3D metallic woodpile structures. Well-defined TiO₂ woodpile structures were fabricated using a layer-by-layer nanoimprint method using TiO₂ nanoparticle ink dispersions. The TiO₂ woodpile was then coated with a high purity, conformal gold film via reactive deposition in supercritical carbon dioxide. The final gold-coated woodpile structures exhibit strong spectral and polarization specific thermal emission enhancements. The fabrication method demonstrated here is promising for high-throughput, low-cost preparation of 3D metallic woodpile structures and other 3D nanostructures.

¹Center for Hierarchical Manufacturing, NSF

Shengkai Li
Univ of Mass - Amherst

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