Spatially and temporally reconfigurable temperature control at the microscale.

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We propose and demonstrate a dynamic microscale temperature-shaping technique by tailoring the illumination of a homogeneously distributed gold nanoparticles (NPs) array. The method consists in (i) calculating the heat source density able to create a desired temperature map [1], (ii) using a wavefront engineering technique to reproduce this heat source density in the NPs plane. We validate the method by imaging temperature with wavefront-sensing-based thermal microscopy [2,3]. We experimentally demonstrate the optical projection of multiple tailored temperature patterns with different temperature values at the micrometer scale. Using cultured hippocampal neuron cell images, we also show that this concept is well adapted to the selective and accurate heating of single cells or cellular bodies.

Figure 1. Dynamic temperature shaping at the micrometer scale by exploiting plasmonic absorption of gold nanoparticles

References

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