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The effect of light polarization on the thermoplasmonic properties of an array of hexagonal dimer nanoparticles

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Abstract

Surface plasmons have been used recently to generate heat nanosources, the intensity of which can be tuned, for example, with the wavelength of the excitation radiation and polarization. We present versatile analytical investigations for the three–dimensional computation of the temperature rise in complex planar arrays of metallic nanoparticles. In the case of elongated particles sustaining transverse and longitudinal plasmon modes, we show a simple temperature rise control of the surrounding medium when turning the incident polarization. In this article, the results of analytical simulation for the temperature distribution are presented in a planer array of gold hexagonal dimer nanoparticles and it is investigated how the temperature distribution of the array will change by changing the polarization angle of the incident light and wavelength. The polarization angle of the incident light is considered in 0 degrees (parallel to the dimer axis) and 45 degrees, and 90 degrees (perpendicular to the dimer axis) and, according to the resonance wavelengths in each polarization, the temperature distribution and value have been simulated. In 90-degree polarization, light absorption is the most, and the highest wavelength of it occurred at 1334 nm, and this wavelength causes high-temperature changes in the array.

Keywords: plasmonic, surface plasmon resonance, thermoplasmonic, hexagonal nanoparticles, array of nanoparticles, polarization.

For full article, refer to the Persian section