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Photothermal Plasmonic Effects and Localization of Excess Temperature Using Metal Nanostructures LAROUSSE KHOSRAVI KHORASHAD, LUCAS V. BESTEIRO, ALEXANDER O. GOVOROV, Ohio University — Heat dissipation is an essential aspect of photo-excited nano-systems. Nanoparticles (NPs) and nano-engineered materials have recently been used for their heat generation properties in applications such as bio-sensing, photo-chemistry, and energy harvesting. In most nano-heating applications, efficient localization of temperature remains a challenge. We theoretically study heat dissipation for spherical NPs. We introduce figures of merit for the localization of temperature and power efficiency of photo-heating. Our investigation focuses on two complex systems. The first one is composed of two large spherical NPs, working as a nano-optical antenna, along with one small NP in the middle, functioning as an electromagnetic and thermal hot spot. We show that based upon the geometry and sizes of the first structure, the temperature is "focused" in the hot spot but the power efficiency of the trimer is much smaller compared with a single NP system. To solve this issue, we use a small nanorod instead of a small NP for our second structure. We observe a plasmonic Fano effect in the second complex, which results in strong enhancement in the local excess of temperature, temperature localization, and power efficiency.

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