Plasmonic Heaters Monitored in-situ with Nd^{3+}-based Nanothermometers as Candidates for Photodynamic Therapy in the Near-Infrared

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The development and even the survival of cells and bacteria only happen in a narrow range of temperatures. Accordingly, a controlled and localized temperature increase can be exploited as a therapeutic tool for infections or cancer. With this idea in mind, plasmonic nanostructures have been proposed as efficient nanoheaters that can be activated with light.[1, 2] However, for the treatment to be efficient and to minimize the chances of overdosing, it is needed to monitor the actual temperature of the treated area. Since temperature measurement at the nanoscale is also relevant in order to study additional biological processes related with the metabolism of cells, over the last years several molecules or nanomaterials with thermally-dependant properties have been developed as thermal probes.[3] In this work we have developed inorganic nanoparticles doped with Nd^{3+} that can be used as optical probes of temperature. These nanoparticles have been combined with gold nanostructures in order to study their heating efficiency and thermal stability. As *in vivo* applications would benefit from high penetration depths of the probe signal and the excitation, both the heater and the thermometer have been designed to work at wavelengths within the biological transparency windows.

References

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