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Heating with inorganic nanoparticles: applications in life science

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The capability of being able to release heat upon remote electromagnetic (EM) exposure has opened new opportunities for a variety of goals in life sciences. Local heating with colloidal nanoparticles (NPs) has been used for killing tumoral cells, drug-release applications, ultralow detection of tumoral markers, imaging *in vivo* and *in vitro*, or even sterilization. In the frame of oncological hyperthermia, both magnetic and plasmonic NPs have been investigated as nanoheaters and can be remotely activated by radiation that do not or minimally interact with physiological tissues and fluids. Actually, the major challenge concerning colloidal chemistry within this framework resides in being able to produce NPs that absorb in EM regions where tissue absorption remains minimum, i.e., biological windows. Engineered nanomaterials with tailored heating performance, as well as suitable organic coatings, are continuously developed toward more efficient interactions with EM radiation and the performance of more complex tasks in biological environments. Moreover, these materials can be used simultaneously as contrast agents by using imaging techniques that rely on their magnetic (e.g., MRI) or plasmonic behavior (e.g., OI), thereby enabling theranostic NPs. In this talk, several examples of nanoheaters for applications in life science will be discussed.

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