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seminar

Wednesday, 21st July, 9.30am, Online

Host: Prof. Luis M. Liz-Marzán

Evaluation of global and local induced temperature therapeutic profiles in magnetic and photo-thermal nanoparticles for biomedical applications

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In biomedicine, magnetic and photo-induced hyperthermia therapies employ nanoparticles as heating sources for efficient therapeutic purposes in the fight of oncological diseases. However, these therapeutic effects have been also observed by localized nanoparticle heating without a detectable macroscopic temperature rise [1]. Local heating effects produced at the nanoparticle´s surface are a key issue to evaluate the onset of thermal doses and quantify possible side effects derived from achieving high local temperatures (i.e. destroying healthy cells in the tissue, degradation of proteins and enzymes in the extracellular medium, etc). In this work, we investigate the heating efficiency of nanoparticles subjected to magneto- and photo-thermal effects in combination with other therapeutic approaches methods in different biological environments [2,3]. Moreover, we also explore the use of the extended X-ray absorption fine structure (EXAFS) analysis as a direct and in situ probe to determine the local temperature at the nanoscale of gold-based nanoparticles upon laser photo-excitation, revealing significant nanothermal gradients [4].

[1] E. Cazares-Cortes et al., ACS Appl. Mater. Inter. 9, 25775 (2017).
[2] A. Espinosa et al., Adv. Funct. Mater. 28, 1803660 (2018).
[3] A. Espinosa et al., Small 16, 1904960 (2020).
[4] A. Espinosa et al., Nano Letters 21, 769 (2021).