Ag_2S nanoparticles-based thermal sensing: From photoluminescence signal to reliable temperature readings

Lise Abiven[1,2,3], Victor Castaing[2], Thomas Lécuyer[3,4], Florence Gazeau[3], Bruno Viana[2], Corinne Chanéac[1]

1. Sorbonne Université, CNRS, Collège de France, LCMCP, 4 Place Jussieu, 75005 Paris, France
2. IRCP, PSL Chimie ParisTech, CNRS, 11 Rue P. & M. Curie, 75005 Paris, France
3. Université Paris Diderot, CNRS, MSC, 10 rue Alice Domon et Léonie Duquet, 75013 Paris, France
4. Université Paris Descartes, Faculté de Pharmacie, CNRS, UTCBS, 4 Avenue de l'observatoire, 75006 Paris, France

Biocompatible nanoheaters are of great interest as they can sensitize tumor microenvironment by changing local temperature distribution [1]. This adjuvant therapy is called Hyperthermia and is of great interest to reduce cancer therapy invasiveness for patients. Nevertheless, having access to local temperature reached within tumor environment during hyperthermia treatment remain a challenge. Thermometry based on phosphor materials appears to be the solution of choice to perform in real-time temperature readings at cellular scale; and thus to accurately monitor and control local temperature induced by hyperthermia treatment [2].

We aim to evaluate silver sulfide phosphors (Ag_2S) as nanothermometer to probe local temperature within tumor microenvironment. Ag_2S photoluminescence intensity depends a lot on temperature. In addition, Ag_2S nanoparticles emit in the second biological window. In this wavelength window, tissues are transparent to photons. As a result, light signal can be easily detected out of living systems after Ag_2S injection to have information about temperature.

In this talk, we detail how to go from photoluminescence signal to reliable temperature readings. It is a question of common concern within nanothermometry community as temperature probe environment causes photoluminescence signal distortion [3]. To have a good understanding both of underlying challenges and possible solutions, we suggest to study three cases, corresponding to three potential Ag_2S-nanothermometer environments: (i) a non-diffusive and non-absorbent medium (D_2O), (ii) a non-diffusive and absorbent medium (H_2O) and (iii) a diffusive and absorbent medium (biological tissues).

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References

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