Thermopolymerization induced through the plasmonic excitation of gold nanoparticles

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Localized surface plasmon-induced polymerization of free-radical acrylate monomers is an efficient, smart, and versatile method for preparing metal/polymer hybrid nanoparticles (NPs) with accurate control of the thickness and spatial distribution of the polymer on the NP surface. Despite a growing number of practical demonstrations, the mechanism leading to polymerization of the acrylate monomer by localized surface plasmon resonance is still controversial. Indeed, trough decay processes, the plasmon emitted light, hot charge carriers and heat (Figure 1). If these processes are well-known, the main difficulty is to discriminate between them.

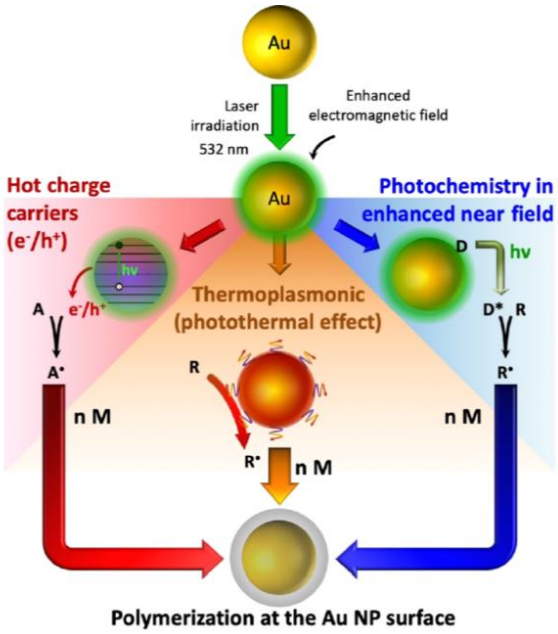

Figure 1. Schematic of the three main pathways to graft polymer through the plasmonic excitation of gold NPs. [1]

Previous experiments performed in the laboratory, highlighted the photochemical pathway as the main mechanism under mild irradiation. [1] The thermoplasmonic pathway was already used to cure InZnO thin films. [2] Here, we investigated thermoplasmonic to graft thermopolymer onto NPs. Different parameters are considered to address specifically thermopolymerization through the plasmonic excitation of NPs (i.e. single/assembly of NPs, continuous/pulsed laser excitation...).

[1] F. Kameche, W. Heni, S. Telitel, L. Vidal, S. Marguet, L. Douillard, C. Fiorini-Debuisschert, R. Bachelot, O. Soppera, *The Journal of Physical Chemistry C,* **2021**, *128*, 8719-8731

[2] C-F. Lin, A. Khitous, H-W. Zan, O. Soppera, *Advanced Optical Materials*, **2021**, *9* (21), 2100045