Plasmon-Resonance Energy Transfer for Lighting Materials

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Organic Light-emitting diodes, known as OLEDs, are used as eco-friendly sources of light based on the electroluminescence phenomenon. However, improvements in the efficiency of current OLED devices, with reduction of fabrication costs, are needed in order to expand their applications.[1] Our approach looks at the nano-scale, using plasmonic architectures. The central unit is a metallic nanoparticle (NP) that supports a localized surface plasmon resonance (LSPR) to enhance the electromagnetic field surrounding the nanoparticle. Thus, the luminescence quantum yield of a dye located in this area can be increased by Plasmon-Resonance Energy Transfer effect (PRET).[2]

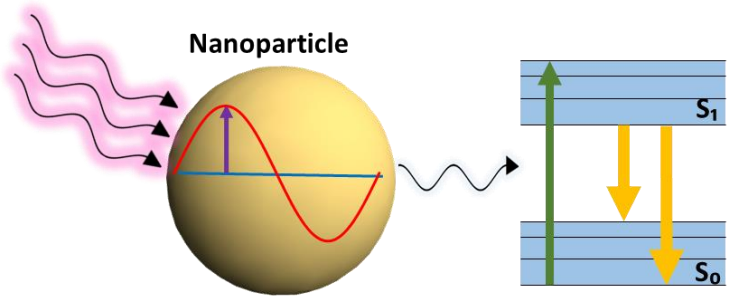

Figure 1. Scheme of the PRET effect on a metallic nanosphere.

These architectures are based on silica scaffolds that allow the incorporation of different dyes using silylated groups. The final target would be the incorporation of red and blue dyes in the same system so the combined emissions result in enhanced white light. In our case, blue and red dyes could interact with silver and gold NPs, respectively.

To do so, we have followed two different approaches: the first one consists on the synthesis of big AuNPs (diameter of 50nm) that are coated with a silica shell that acts as scaffold for the red dyes to be anchored. The next step will be the incorporation of a second silver layer so the blue dye can be also incorporated to the system. The second approach consists on the incorporation of small NPs (3-10nm) in the pores of a mesoporous silica material[3] (COK-12 in this case), where we can combine particles of different materials as well as different kinds of dyes.

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