Synthesis of gold octahedra. Size control and encapsulation in thermoresponsive microgels.

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Abstract

A general method to encapsulate gold nanooctahedra within thermoresponsive poly(*N*-isopropylacrylamide) (pNIPAM) shells is described.

Au octahedra with well-controlled sizes and optical properties have been synthesized through a seed-mediated growth method. This method is based on the use of gold nanorods as seed and butenoic acid as mild reduction agent in the presence of benzyldimethylhexadecylammonium chloride (BDAC).[1] The growth process can be followed by UV-vis spectroscopy. The edge length of the Au octahedral can be easily tuned from 65 to 90 by varying the molar ratio of Au salt to Au seeds. Figure 1 shows TEM images of original Au nanorod,(A) used as seeds, and Au octahedra obtained after the growth step (B, C) and their corresponding optical properties (E). Figure 1D displays a SEM image of the Au octahedral shown in Figure 1C

Moreover, butenoic acid provides the particles surfaces with vinyl functionality through its adsorption via carboxylic groups. Such surface modification allowed the encapsulation of the particles within pNIPAM microgels by simply adding the Au octahedra in the pNIPAM polymerization media. Figure 1F shows a TEM image of the Au nanoparticles after their encapsulation. It should be noted that those hybrid nanoparticles preserve the main properties of the plasmonic core and the polymeric shell.

References

[1]R. Contreras-Cáceres, J. Pacifico, I. Pastoriza-Santos, J. Pérez-Juste, A. Fernández-Barbero, L.M. Liz-Marzán, Adv. Funct. Mater. **2009,** *19*, 3070-3076

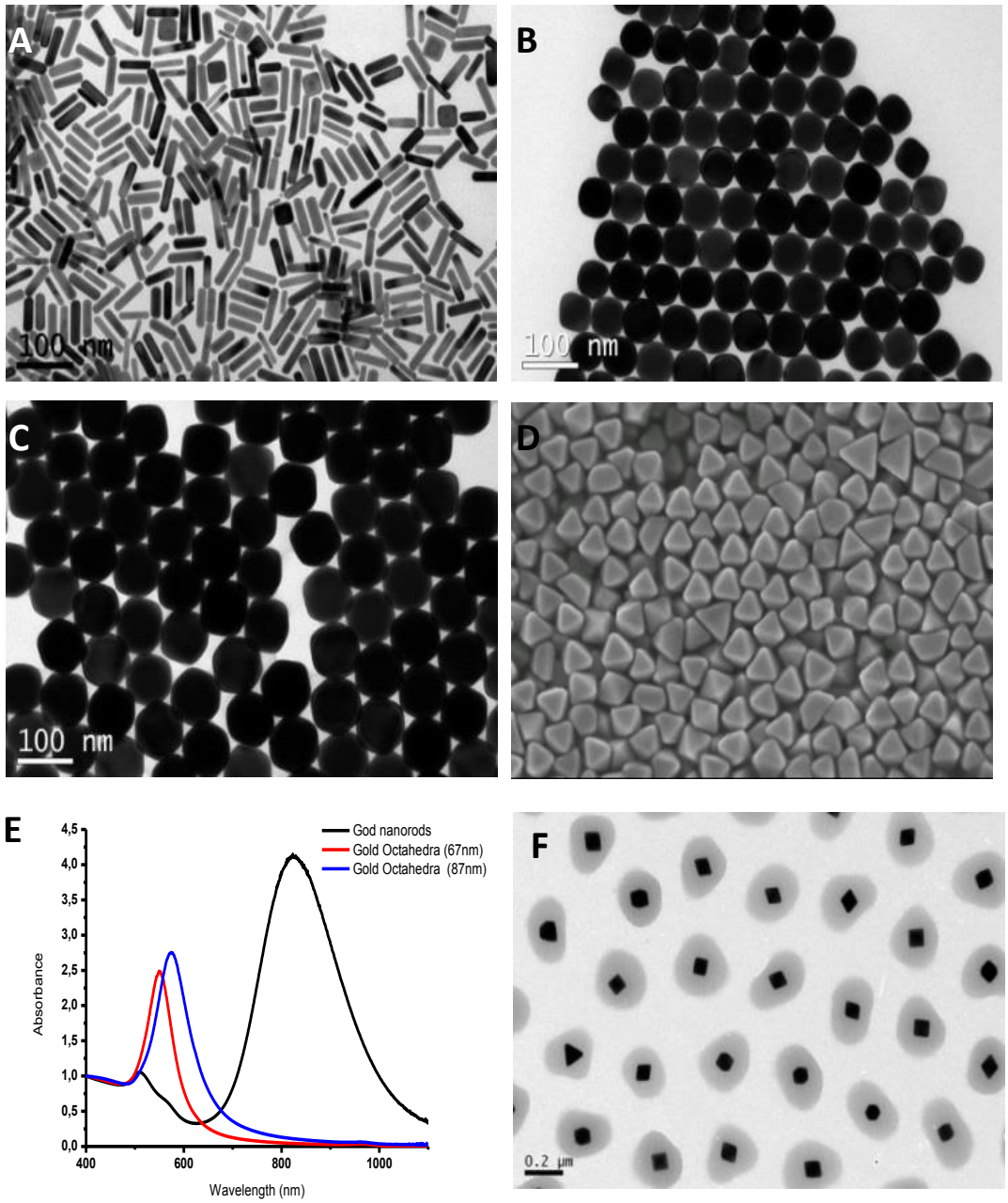

Figure 1. (A-C) TEM images of original Au nanorods (A) and Au octahedra of two different side length (67 nm, B, and 87 nm, C). (D) SEM image of 87 nm Au octahedral. (E) Vis-NIR absorption spectra of the particles shown in A-C as indicated in the labels. (F) TEM image of the Au octahedral after the encapsulation within the pNIPAM microgel.