



POLITECNICO DI TORINO
Repository ISTITUZIONALE

Plasmonic color-graded nanosystems with achromatic subwavelength architectures for light filtering and advanced SERS detection

Original

Plasmonic color-graded nanosystems with achromatic subwavelength architectures for light filtering and advanced SERS detection / PROIETTI ZACCARIA, Remo; Bisio, Francesco; Das, Gobind; Maidecchi, Giulia; Caminale, Michael; Duc Vu, Chinh; De Angelis, Francesco; DI FABRIZIO, ENZO MARIO; Toma, Andrea; Canepa, Maurizio. - In: ACS APPLIED MATERIALS & INTERFACES. - ISSN 1944-8244. - 8:(2016), pp. 8024-8031. [10.1021/acsami.6b00726]

Availability:

This version is available at: 11583/2834720 since: 2020-06-10T14:04:33Z

Publisher:

American Chemical Society

Published

DOI:10.1021/acsami.6b00726

Terms of use:

openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

GENERICO -- per es. Nature : semplice rinvio dal preprint/submitted, o postprint/AAM [ex default]

The original publication is available at / <http://dx.doi.org/10.1021/acsami.6b00726>.

(Article begins on next page)

Plasmonic Color-Graded Nanosystems with Achromatic Sub-Wavelength Architectures for Light Filtering and Advanced SERS Detection

Remo Proietti Zaccaria[†], Francesco Bisio^{⊥}, Gobind Das^{†,‡}, Giulia Maidecchi^{¶,♦}, Michael Caminale^{¶,§}, Chinh Duc Vu^{¶,‡}, Francesco De Angelis[†], Enzo Di Fabrizio[‡], Andrea Toma[†], Maurizio Canepa[¶]*

[†] Istituto Italiano di Tecnologia, Via Morego 30, 16163 Genova (Italy),

[⊥] Istituto Superconduttori, Materiali Innovativi e Dispositivi (SPIN), Consiglio Nazionale delle Ricerche, Corso Perrone 24, 16152 Genova (Italy),

[‡] PSE division, King Abdullah University of Science and Technology (KAUST), Thuwal (Saudi Arabia)

[¶] OptMatLab, Dipartimento di Fisica, Università degli Studi di Genova, Via Dodecaneso 33, 16146 Genova (Italy)

[‡] Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet road, Cau Giay district, Hanoi (Vietnam).

[§] present address: INAC-SPINTEC, CEA, 17 rue des Martyrs - Bat. 10.05, F-38000 Grenoble (France).

[♦] present address: Istituto Italiano di Tecnologia, Via Morego 30, 16163 Genova (Italy)

*to whom correspondence should be addressed. Email: Francesco.bisio@spin.cnr.it

Supporting Information

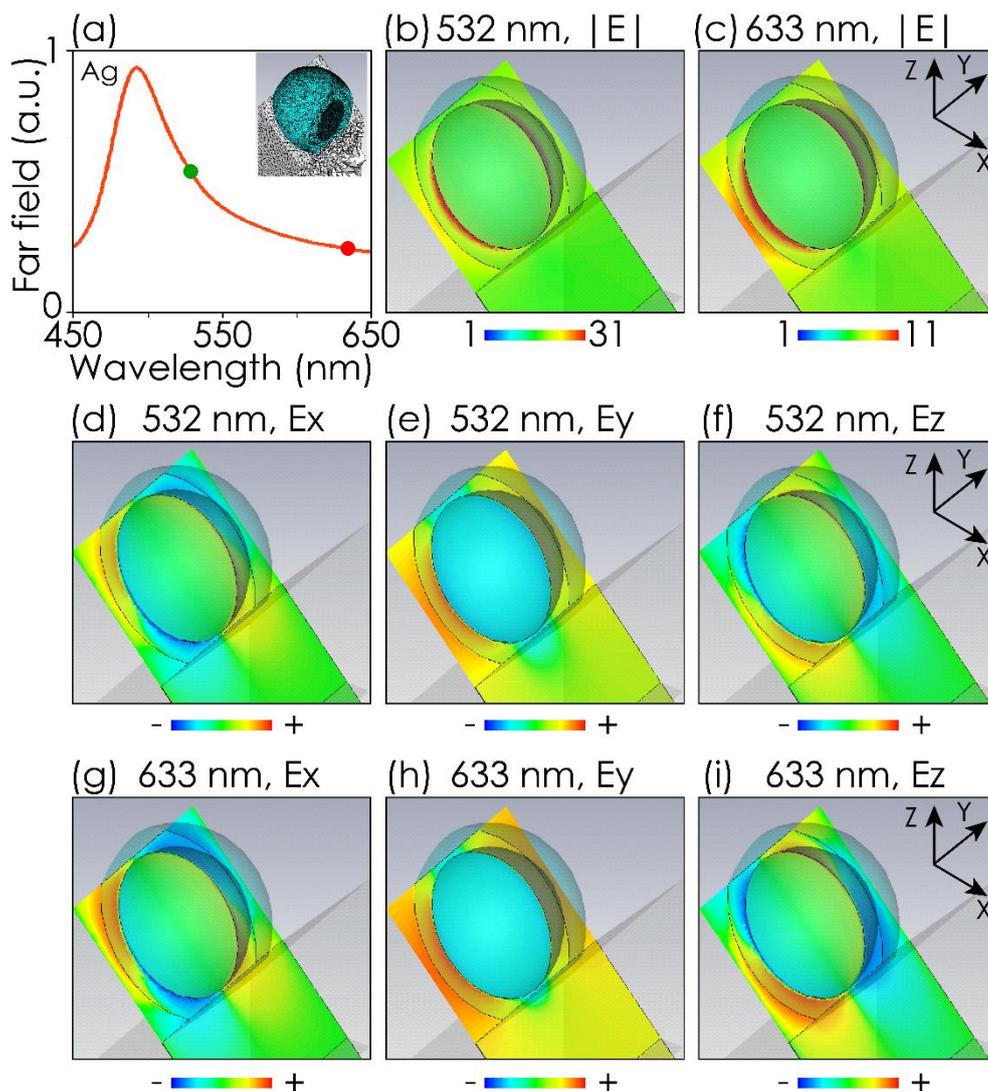


Figure S1: (a) Extinction spectra for Ag when a 3 nm layer of 4-mercaptobenzoic acid is deposited on the nanoparticles. The green (red) dot corresponds to 532 nm (633 nm). The inset shows the mesh resolution (mesh < 0.5 nm). (b-c) Electric field enhancements for the 532 nm excitation calculated immediately outside the 4MBA layer and the metallic nanoparticle, respectively. Both the directionality of the field and its strong decay are clearly visible. (d-f) components of the electric field at 532 nm. (g-i) components of the electric field at 633 nm

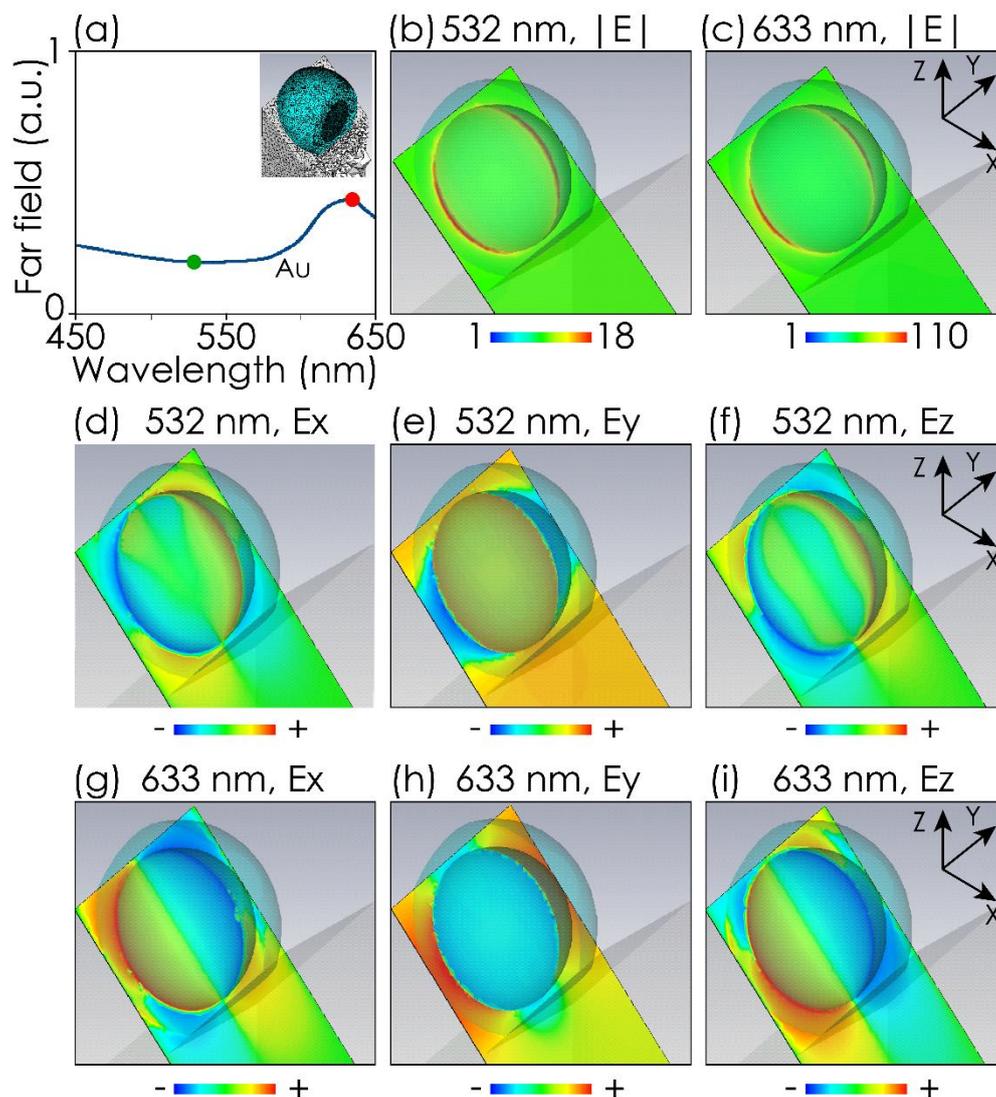


Figure S2: (a) Extinction spectra for Au when a 3 nm layer of 4-mercaptobenzoic acid is deposited on the nanoparticles. The green (red) dot corresponds to 532 nm (633 nm). The inset shows the mesh resolution (mesh < 0.5 nm). (b-c) Electric field enhancements for the 532 nm excitation calculated immediately outside the 4MBA layer and the metallic nanoparticle, respectively. Both the directionality of the field and its strong decay are clearly visible. (d-f) components of the electric field at 532 nm. (g-i) components of the electric field at 633 nm.

Au, Ag and Au_{0.5}Ag_{0.5} permittivity:

Reference [35] was used for the definition of the permittivity of both Au and Ag, which are plotted in Figure 3a and 3b, respectively. Regarding Au_{0.5}Ag_{0.5}, its permittivity was characterized through ellipsometry and the results are shown in Figure 3c. The two dots represent the values of the permittivity at 532 nm and 633 nm.

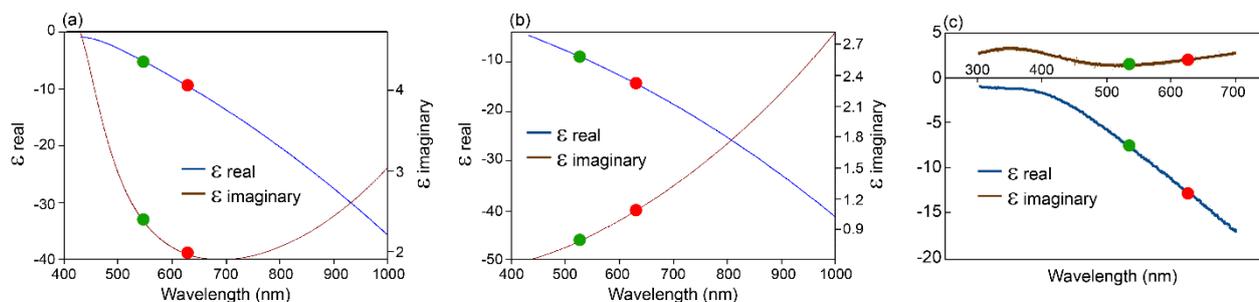


Figure S3: Real and imaginary parts of the permittivity ϵ for: (a) gold as described in [35]; (b) silver as described in [35]; (c) experimental values obtained through ellipsometry. The green and red dots highlight the 532 nm and 633 nm resonances, respectively.

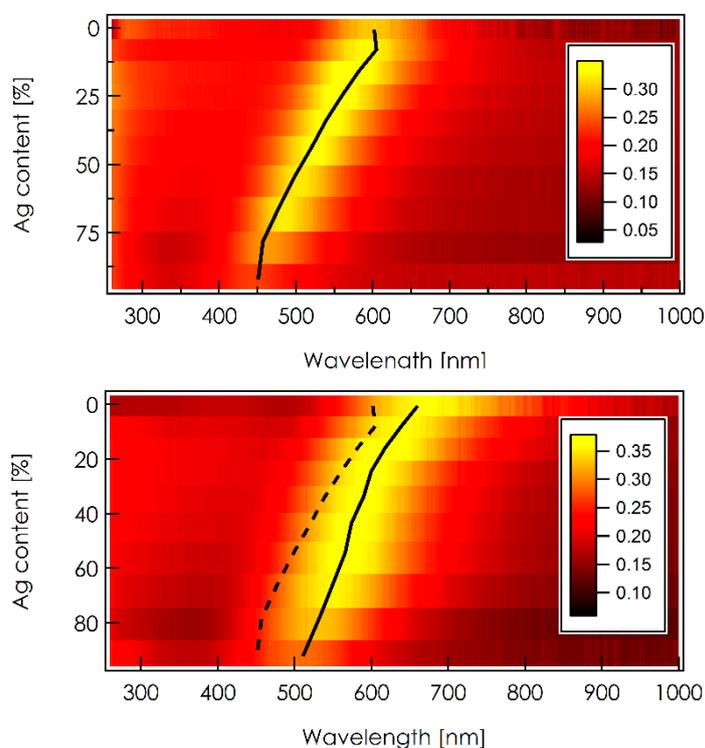
Reflectivity spectra of naked and dressed nanoparticle arrays.

Figure S4: reflectivity maps of the alloy-NP arrays before (top) and after (bottom) the deposition of 4-mercaptobenzoic acid. The continuous black lines represent the reflectivity maxima, corresponding to the LSPR. The dashed black line in the bottom panel represents the reflectivity maxima for the naked particles, and is reported to highlight the LSPR redshift following the molecule deposition.