DIPARTIMENTO DI SCIENZE MATEMATICHE E INFORMATICHE, SCIENZE FISICHE E SCIENZE DELLA TERRA
Dottorato di Ricerca in Fisica

Appunti di Fisica '21

10 febbraio ore 15:30

webinar su Microsoft Teams

Self-assembled nanostructures for applications in plasmonic metamaterials

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Spherical organization of metallic nanoparticles, also known as core-shell clusters, have stimulated the interest of the metamaterials community, both from a theoretical[1], and experimental[2] point of view. The main advantage of such arrangements involves their highly tunable optical properties and it has been proposed that they will facilitate improvements towards materials with double negative properties at optical frequencies[3-5].
This talk involves the design, fabrication and characterization of metamaterials based on meta-atoms and its assemblies. The approach starts with the bottom-up preparation of nanoresonators, which consist in core-shell structures made of plasmonic nanoparticles covering a dielectric core. The coupling between the plasmonic units leads to new plasmon resonances that have a magnetic dipole character. The next step involves the meta-atoms organization on surfaces. Highly ordered monolayers of core-shell clusters over large area were obtained via a combination of blade coating deposition and electrostatic self-assembly. The structural and optical properties of such complex plasmonic core-shell clusters array are investigated and compared to rigorous simulations.

1. Mühlig, S., Farhat, M., Rockstuhl, C. & Lederer, F. Cloaking dielectric spherical objects by a shell of metallic nanoparticles. *Phys. Rev. B - Condens. Matter Mater. Phys.* **83**, 1-7 (2011).
2. Liz-marza, L. M., Pastoriza-santos, I., Gomez, D. & Pe, J. Optical properties of metal nanoparticle coated silica spheres: a simple effective medium approach. *Phys. Chem. Chem. Phys.* **6**, 5056-5060 (2004).
3. Mühlig, S. *et al.* Self-assembled plasmonic core-shell clusters with an isotropic magnetic dipole response in the visible range. *ACS Nano* **5**, 6586-6592 (2011).
4. Barois, P. *et al.* Characterization of optical magnetism of self-assembled plasmonic nanoclusters $\mu \neq 1$ in 3D atoms in visible light : 1-9 (2015). doi:https://doi.org/10.1016/j.pec.2018.06.015
5. Simovski, C. R. & Tretyakov, S. A. Model of isotropic resonant magnetism in the visible range based on core-shell clusters. *Phys. Rev. B - Condens. Matter Mater. Phys.* **79**, 1-9 (2009).

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