

# OSE SEMINAR SERIES

Dr. Stefano Cabrini,

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Thursday, October 27, 2016 at CHTM, Rm. 103

11:00 AM to 12:00 PM

## Sub-10-nm Three-Dimensional Plasmonic Probes and sensors



### Abstract:

Plasmonic antennas have been investigated as potential sensing element since long, but great part of the efforts on the nanofabrication have been devoted to the 2 dimensional patterning. Many times the "sensing or probing" processes require geometries of the probe that are more complicated than the simple flat surface. In this seminar, I will show some example of three dimensional structures and their plasmonic properties as well as their application as sensors for IR spectroscopy and probes for Near-field scanning optical microscopy. I will present a series of structures and their characterization in IR as well as visible light. Particularly I will focus on the application of NSOM as a powerful and unique technique to characterize the chemical, physical and biochemical properties of materials with the nanometer scale resolution in real-time. One of the main challenges in using NSOM for a broad range of applications is the development of reproducible and efficient near-field probes. A novel class of nano-optical probes has been recently proposed, namely "campanile". Campanile tips consist of a 3-Dimensional (3D) tapered structure terminated by a plasmonic nano-antenna, which provides superior NSOM performance and decisive advantages. I will present a novel approach to drastically simplify the fabrication of Campanile probes by ultraviolet nanoimprint lithography (UV-NIL) directly on the facet of commercial optical fibers, without the need to use FIB. The 3D mold is fabricated by a combination of polymer embossing and FIB lithography in a Helium Ion Beam. I will show some characterization measurement, as well as some NSOM hyperspe

**Biography:** Stefano Cabrini is the Nanofabrication Facility Director, Molecular Foundry Lawrence Berkeley National Laboratory, one of five Nanoscale Science Research Centers (NSRCs), national user facilities for interdisciplinary research at the nanoscale, supported by the Department of Energy (DOE) Office of Science. He received his PhD in physics (Laurea degree) from the University of Rome "La Sapienza" and was a European Postdoc Fellowship at « Institut d'Optique Théorique et Appliquée », Orsay France. He is expert in micro-nano-fabrication, electron-beam lithography, focused ion beam lithography, nanoimprinting, thin-film deposition and plasma etch. His research interest includes nanophotonics, plasmonics, development of new lithographic tools and processes, Single Digit Nano Fabrication (exact fabrication of nanostructures with dimensions below 10 nm), development of engineered nanodevices for the control of the light at nanometer scale, and application of plasmonic resonators and transparent dielectric photonic devices for light confinement and propagation. He has published more than 120 articles on international peer review journals. He was also co –editor of the "Nanofabrication Handbook" CRC Press 2012.

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