seminars

Nanociencia y Nanotecnología: lo pequeño es diferente

Nanoscience and Nanotechnology: small is different

Thursday 25th May 2017 11:00h

C/Faraday, 9
Conference Hall
Imdea Nanociencia
Ciudad Universitaria de Cantoblanco

Fabrication, linear and nonlinear spectroscopy of optical nano-antennas and hybrid antenna-systems

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Plasmonic nanostructures that act as optical nanoantennas for visible light offer interesting opportunities for locally concentrating and enhancing the electric near-field of an incident light wave, or of spectrally tuning the antenna characteristics via the size, shape and material. These properties are increasingly employed for the development of high-resolution optical mi-croscopy and nanospectroscopy. Using various nanofabrication techniques, suitable antenna structures can be prepared for surface-enhanced Raman spectroscopy (SERS), optical near-field scanning probes, or nano-optical (bio-)sensors. By combining the antenna structures with a second component in hybrid configurations, such as quantum dots, fluorescent molecules, or organic thin-films, the antennas can be employed to modify the absorption and emission char-acteristics of these objects in the coupled system. Key challenges in this context are the opti-mization of the antenna properties in view of the envisaged application, as well as achieving selective coupling of the nano-emitters to the high near-field regions of individual antennas.
In this presentation the top-down nanofabrication of different optical antennas by various nano-lithographic techniques, combined with etch-mask transfer, will be demonstrated. Their linear and nonlinear optical properties are investigated. Conical nanoantennas offer narrow, high near-field intensity hotspots near their tip apexes. Different procedures for selectively coupling few or single nano-emitters to these tips will be shown. Applications of different hy-brid antenna configurations for absorption enhancement in organic thin films, emission en-hancement and lifetime reduction of single quantum dots coupled to nanocones, and biosens-ing through plasmon resonance shifts after integration in a microfluidic environment will be illustrated

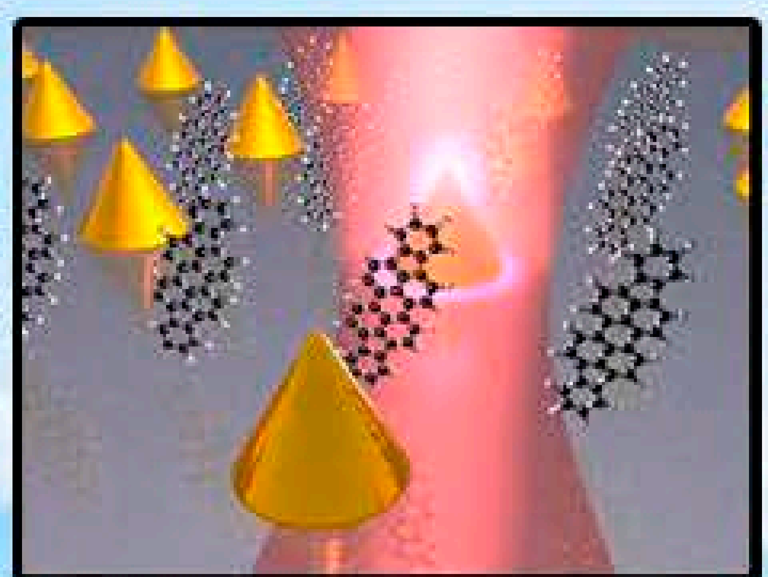

fig. zSchematic illustration of spectroscopic investigation of optical antennas and organic molecules (not to scale)

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2. Schäfer, C., Kern, D.P., Fleischer, M. (2015), Lab Chip 15, 1066
3. Fulmes, J., Jäger, R., Bräuer, A., Schäfer, C., Jäger, S., Gollmer, D.A., Horrer, A., Nadler, E., Chassé, T., Zhang, D., Meixner, A.J., Kern, D.P., Fleischer, M. (2015), Nanoscale 7, 14691
4. Horrer, A., Krieg, K., Freudenberger, K., Rau, S. Leidner, L., Gauglitz, G., Kern, D.P., Flei-scher, M. (2015), Anal. Bioanal. Chem. 407(27), 8225

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