Optical and photoelectrical properties of plasmonic system based on 1D array gold nanowires with chalcogenide core

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Resume : Recently, new functional materials with promising properties were studied extensively for fundamental and practical interests: sensory, photovoltaics, optoelectronics etc. One of them is 1D array of metal nanowires on flat dielectric or semiconductor substrate. The resonance interaction of electromagnetic waves with the peridiole nanoradiators causes the surface plasmon to excite local plasmon (LP) and surface plasmon polariton (SPP) with resonance enhancement of electromagnetic field localized at surface (beyond the diffraction limit) resulting in extraordinary sensitivity to surface conditions. The work is devoted to the theoretical and experimental study of optical and photoelectric properties of periodical system of nanowires with complex structure (metal shell – chalcogenide core) on a flat semiconductor substrate. Optimization of geometrical parameters and influence of interaction between separated nanowires by addition metal film was considered. It was shown that the inclusion of additional interaction between the wires dramatically enhances the resonant light transmission through system by increasing the intensity of the SPP. Due to the interaction of the SPP and LP modes the phase is modified from Gaussian to Fano with sharper slope which leads to the increasing of sensitivity of optoelectronics devices. So, the intensity of LP, SPP waves and their interaction could be controlled by choosing of suitable geometrical parameters of relief.

Improved mode size determination for single mode Ti : LiNbO3 strip waveguides

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Resume : In the design of single mode Ti-diffused LiNbO3 modulators it is desirable to know the mode size to be able to maximise the phase shift along the guide, so as to achieve high efficiency. The spot size is determined by the following variational method. A well chosen field distribution in the waveguide is used as a trial function for finding a stationary expression for the propagation constant $\beta$, with the spot size then being taken as that value which gives maximum $\beta$. This approach has been used with both optical fibres and integrated optics. In the case of the integrated waveguide a comparison of theoretical and experimental results has been carried out with only limited success, although the geometric mean of the calculated orthogonal half-intensity modes sizes agreed well with experiment. The analysis used was stated to be valid for the problem to a one-dimensional one. Our analysis uses a two-dimensional solution, and a more accurate form is derived for the propagation constant expression. Comparison of the new numerical results now gives closer agreement with experiment.

The Absorption Coefficient of PbSe/CdSe and PbS/CdS Core/shell Colloidal Quantum Dots

Authors : Bram DE GEYTER, Yolanda JUSTO, Stijn FLAMEE, and Zeger HENSE Department of Physics and Astronomy, Ghent University, Gent, Belgium

Resume : Colloidal quantum dot (QD) research is driven by the combination of tunable electronic and optical properties, depending on the size and shape of the QDs, and an easy, solution-based fabrication and processing. For practical applications and fast synthesis optimization, a precise knowledge of the absorption coefficient is key to determine the concentration of QD suspensions. Recently, the research field has shifted focus from plain QDs consisting of a single material, to more complex heterostructures, consisting of at least two materials. We use PbSe/CdSe and PbS/CdS core/shell colloidal quantum dots QDs as model system to study the absorption coefficient of colloidal QD heterostructures, consisting of at least two semiconductor materials. We show that at energies far above the band gap 3.1 and 3.5 eV/\mu m the experimental intrinsic absorption coefficient is in excellent agreement with the Maxwell-Garnett effective medium theory for core/shell heterostructures and bulk values for the dielectric function. This allows for a straightforward measurement of the QD concentration from the absorbance spectrum. It also implies that basic optical measurements on core/shell heterostructures, such as measurements of the oscillator strength and photoluminescence lifetime, can be corrected for the local field reduction in QD heterostructures. References [1] B. De Geyter et al. Appl. Phys. Lett. 97, 161908 (2010)

Electric properties of junctions between 1D carbon nanostructures and metal substrate: theoretical simulations

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Resume : Carbon nanotubes (CNTs) attract permanently growing technological interest, for example, as promising candidates for nanointerconnects in a high-speed electronics. New possibilities for nanoelectronics are opened with a novel form of graphene – nanoribbons (GNRs), which mainly demonstrate a lossless mechanism of conductivity, similarly to CNTs. We consider conductivity and resistivity as a scattering problem, where the current carriers participate in the transport according to mechanisms based on presence of the scattering centers (charge and structural defects, phonons, etc.). Computational procedure developed for these calculations is
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PLENARY SESSION (Wed. afternoon - May 11)

Preliminary program

THIN FILMS & NANOMATERIALS

A  MACAN11: reconciling atomistic and continuum approaches to interfaces
B  Ion beam synthesis and modification of nanostructured materials and surfaces
C  Size-dependent properties of nanomaterials

D  Synthesis, processing and characterization of nanoscale multi functional oxide films III

ELECTRONICS & PHOTONICS

E  From photophysics to optoelectronics of zero- and one- dimensional nanomaterials
F  Group III nitrides and their heterostructures for electronics and photonics
G  Semiconductor nanostructures towards electronic and optoelectronic device applications
H  Indium nitride and related alloys
I  Transport and photonics in Si-based nanomaterials and nanodevices

MATERIALS FABRICATION & CHARACTERIZATIONS

J  Laser materials processing for micro and nano applications
K  Protective coatings and thin films
L  Basic research on ionic – covalent materials for nuclear applications
M  X-ray techniques for materials research – from laboratory sources to free electron lasers

ORGANIC & BIOINSPIRED MATERIALS

N  Controlling and characterising the structure of organic semiconductor films
O  Bio-nanomaterials for imaging, sensing and actuating
P  Bio-inspired and bio-integrated materials as new frontiers nanomaterials

BILATERAL CONFERENCE ON ENERGY

Q  Engineering of wide bandgap semiconductor materials for energy saving
R  Advanced inorganic materials and concepts for photovoltaics
S  Organic photovoltaics: science and technology (OPV)
T  Materials for solar hydrogen via photo electrochemical production