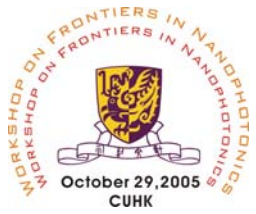

Postgraduate Poster Session 15:15-16:00

Saturday 29th October 2005

T.Y.Wong Lecture Theatre, Ho Sin Hang Engineering Building,

The Chinese University of Hong Kong

No	Title	Email
1	AC electric field assisted photo-induced high diffraction efficiency orientational grating in nematic liquid crystals	lsong@cuhk.edu.hk wklee@phy.cuhk.edu.hk
2	Simultaneous measurement of six optical parameters in a planar optical waveguide	ypwang@china.com
3	Contributions of a co-host electron transport layer	chchoy@eee.hku.hk
4	Extraordinary Transmission in one-dimensional patterned metallic films effects of geometric profile of slits	kyfong@sun1.phy.cuhk.edu.hk
5	Photonic Nanojet Scanning Microscope: numerical simulations an preliminary experiments	eeawpoon@ust.hk
6	ZnSe Nanorings	chchoy@eee.hku.hk
7	Enhanced infrared responsivity of Helium implanted SOI waveguides	yliu@ee.cuhk.edu.hk
8	Coupled plasmon waves and their localization in incrementally-spaced plasmonic nanoparticle chains	jjxiao@sun1.phy.cuhk.edu.hk
9	Pattern effects inhibition in semiconductor optical amplifier using carrier reservoir in an asymmetrical multiple quantum well structure	smwan@ee.cuhk.edu.hk
10	Study of free carrier absorption in silicon-on-insulator nano-wire waveguide	chkwok@ee.cuhk.edu.hk
11	Wavelength conversion in Micro-structure fiber	chkwok@ee.cuhk.edu.hk
12	Selective area growth of gallium oxide nanowires on gallium arsenide assisted by implantation and patterned gold	kclo@ee.cuhk.edu.hk
13	Chemical vapour deposition and characterization of zinc oxide thin films and nanostructures	huiwang@ee.cuhk.edu.hk
14	Nano-bioimaging by Fiber-optic Nano-biosensor(FONBS) & Near-field Scanning Optical Microscope(NSOM)	ytzhang@ee.cuhk.edu.hk

[1]

AC electric field assisted photo-induced high diffraction efficiency orientational grating in nematic liquid crystals

Liang Song and Wing-Kee Lee

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We report photo-induced orientational diffractive grating formation assisted by an applied ac field in fullerene (C_{60}:C_{70} ~ 90:10) doped and undoped 50-micron-thick homeotropic NLC cells filled with mixture of NLC 5CB and 8OCB of 65 and 35 wt %, respectively. Experiment was conducted using the typical setup for two-beam-coupling experiments in NLCs. The two coherent 515 nm Ar+ laser writing beams were s-polarized and the 633 nm He-Ne laser probe beam was p-polarized.

Compared with that using a dc field, the scattering noise due to thermal fluctuation of the director is greatly reduced under the applied ac field. Moreover, the grating formation time can be as short as 1 s, ~100 times shorter than that using a dc field. The maximum first-order diffraction efficiency reaches 30 %, ~1.5 times larger than that using applied dc field. The nonlinear index coefficient n_2 is found to be ~0.9 W/cm^2, comparable with that obtained in CNT-doped NLCs, and ~1000 times larger than that in C_{60}-doped NLCs reported previously.

We believe the observed merits of the application of ac field are due to effective suppression of the electrohydrodynamic instability by using an ac field, resulting in more efficient space-charge field formation not possible for a dc field.

[2]

Simultaneous Measurement of Six Optical Parameters in a Planar Optical Waveguide

Yi-Ping Wang[1, 2)], Dong-Ning Wang[1)], Wei Jin[1)], Jian-Ping Chen[2)], and Xinwan Li[2)]

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A novel reflectometry based on Michelson interference is proposed and demonstrated to measure six optical parameters of planar optical waveguide. Such a reflectometry can measure refractive

index, thickness, insertion loss, absorbed loss, Fresnel reflectance, and diffuse reflection coefficient of optical waveguides, simultaneously. It overcomes the disadvantages of other methods that can usually measure only one or two optical parameters. The reflectometry overcomes the disadvantages of other methods that can measure only one or two optical parameters. Moreover, it owns some advantages, such as straightforward measurement, simple configuration, and easy operation. It is a contactless measurement technique so that the surface quality of the measured waveguide is not affected or destroyed.

[3]
Contributions of a Co-Host Electron Transport Layer

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**chchoy@eee.hku.hk*

We have studied the effects of the co-host electron transport layer (ETL) on a green fluorescent dye doped organic light emitting devices. The performance of fluorescent C540 doped green OLED have been improved by utilizing the co-host ETL structure with 50% BPhen-50% Alq_3 weight ratio. The EL efficiency is 8cd/A and 2.42 lm/W at 20mA/cm^2 and 11.2 V respectively. Compared with the C540 doped device with single-host Alq_3 ETL, the performance of co-host structure has increased by 23% in both current and power efficiency. The enhanced performance can be explained by (i) the improvement of the electron injection into doped emitter system through using the co-host ETL, (ii) the hole blocking function of BPhen in the co-host ETL which prevents the formation of cationic Alq_3 species in Alq_3, and (iii) confinement of the exciton in EML.

[4]
Extraordinary Transmission in One-dimensional Patterned Metallic Films: Effects of geometric profile of slits

King Yan FONG and P. M. HUI

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We study extraordinary optical transmission through a metallic film with a periodic array of sub-wavelength slits. In particular, the effects of the geometrical profile of the remaining metallic stripes, and hence the shape of the slits through the film, are studied. A coupled-wave approach

is used in which the propagation of electromagnetic waves through the film is treated as propagation through a series of thin slides, each of which has a slightly different geometrical profile for the metallic stripes and the slits. By matching boundary conditions at each interface of the slides, both the local field in the vicinity of the slits and the transmission can be obtained. The method has the advantage that it includes all the possible mechanisms as included in the dielectric functions of the metal and the voids (slits), e.g. surface plasmonic effects. It is found that for samples with the same amount of metallic materials, there is a shift in the wavelength at which the transmission is a maximum as the geometric profile of the slits is varied. We also study the effects of an anisotropic dielectric function in the system, which can be introduced by applying a magnetic field or by putting an anistropic material, e.g., liquid crystals, inside the slits.

[5]
Photonic Nanojet Scanning Microscope: numerical simulations and preliminary Experiments

Dr. Andrew W. POON and Yi Ho LEE

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We propose and demonstrate a novel optical scanning microscope for sub-micrometer resolution imaging by using a sub-wavelength optical beam known as “photonic nanojet.” We obtain the photonic nanojet by side-illuminating an optical glass fiber with a laser beam. Sub-micrometer resolution imaging is obtained by mechanically scanning a sample illuminated by the nanojet. Our microscope has a high resolution potentially exceeding conventional high-power optical microscopes. We use linear-scanning method to capture a two-dimensional millimeter-sized image in duration of few minutes. The technique is non-destructive and relatively low-cost. We believe our photonic nanojet scanning microscope (PNSM) can become a versatile imaging tool in nano-science and technology.

[6]
ZnSe Nanorings

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One of the key components for the manufacturing nanoscale devices is controlled synthesis. In this study, free standing crystalline ZnSe nanorings and nanowires have been fabricated on Au coated Si substrates by simple thermal evaporation of ZnSe powders. Ring- or wire-like morphology can be achieved in a controllable manner by using different reactor pressures during growth, while all the other conditions remain the same.

The as-synthesized products have been characterized by scanning electron microscopy, transmission electron microscopy, X-ray powder diffraction and energy dispersive X-ray spectroscopy. The results reveal that the ZnSe nanowires are pure zinc-blende structure while the nanorings are mixed with both zinc-blende and wurtzite phases. Most of the nanowires have a diameter of few tens of nm and have a length up to 30 μm. The nanoring is in the form of a close-loop belt. The widths of the rings are in the range of 150-500 nm, the diameters are 3-7 μm and the thickness of 20-100 nm.

To our knowledge, ZnSe rings have not been reported to date. The growth mechanism of the nanorings will be discussed.

[7]
Enhanced Infrared Responsivity of Helium Implanted SOI Waveguides

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The enhanced photo-response of helium ion implanted silicon waveguides as a function of different anneal temperatures and durations is reported. The enhancement in responsivity at communication wavelength was sufficient for use as optical power monitors.

[8]

Coupled plasmon waves and their localization in incrementally-spaced plasmonic nanoparticle chains

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(2) Department of Applied Physics, Graduate School of Engineering, Hokkaido University, N13-W8, Sapporo 060-8628 Japan.

Guiding and manipulating light below the diffraction limit with surface plasmons have attracted substantial interest. Although surface plasmons are generally confined inside subwavelength scale in the lateral direction, manipulating (localizing) their propagation behaviors is also of great importance and challenge. We theoretically studied the eigenmodes of coupled plasmons in coplanar chains of incrementally-spaced metallic nanoparticles.

The coupled plasmons exhibit strong localizations when detuned from the Mie plasmon frequency, showing a tunable passband in finite size systems. The localization-delocalization behavior is discussed in detail. Furthermore,the nearest-neighbor coupling model of the coupled plasmons are mapped into an equivalent of one-dimensional coupled harmonic oscillators, of which the coupling strength is gradually weakened from one end to the other, with an additional on-site potential varying in reverse fashion, which provides great insight into the localization mechanism. The unique and precise way of localizing and transmitting electromagnetic energy in these structures may pave new avenue for applications in plasmonics.

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[9]

Pattern-Effects Inhibition in Semiconductor Optical Amplifier using Carrier Reservoir in an Asymmetrical Multiple Quantum Well Structure

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In this letter, we propose and demonstrate the use of asymmetrical multiple quantum wells (AMQW) for pattern-effect free semiconductor optical amplifiers (SOA). An AMQW-SOA with different quantum wells was designed to provide gain for both 1.3μm and 1.55μm light and fabricated. The wider bandgap quantum wells (1.3μm bandgap wavelength) act as carrier reservoirs to replenish depleted carriers in narrower effective bandgap quantum wells. Using a rate equation model, the interwell carriers transit time was estimated to be 31ps. Experimental results confirmed pattern-effect free gain was achieved for 10Gbps NRZ data stream using AMQW-SOA and operating in the gain saturation regime.

[10]

Study of Free Carrier Absorption in Silicon-on-Insulator Nano-Wire Waveguide

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Dept of Electronic Engineering, The Chinese University of Hong Kong, HKSAR,CHINA.

We study the two-photon absorption and free-carrier absorption induced cross-absorption effect in silicon-on-insulator nano-wire waveguide. The switching extinction in two-photon absorption and the recovery time in free-carrier absorption are characterized with different pulse peak power.

[11]

Wavelength Conversion in Micro-Structured Fiber

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Widely tunable wavelength conversion has been demonstrated using a 64-m-long dispersion-flattened photonic crystal fiber in a nonlinear optical loop mirror. The output extinction ratio can be maintained above 13-dB over 60-nm.

[12]

Selective area growth of gallium oxide nanowires on gallium arsenide assisted by implantation and patterned gold

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We report the synthesis of β-phase Ga_2O_3 nano-wires on gold-coated gallium arsenide (GaAs) by plasma immersion ion implantation (PIII) and rapid thermal annealing (RTA). A nominally un-doped GaAs substrate was first treated with PIII of nitrogen or acetylene (C_2H_2) ions, and then followed by coating the surface with a 40nm thick gold film. After rapid thermal anneal (RTA) at 950^{o}C for 30 seconds, Ga_2O_3 nano-wires were found in the regions covered with gold. Cathodoluminescence revealed that the β-Ga_2O_3 nano-ribbons emit intense ultraviolet, which are attributed to recombination of bound electron-hole excitons. On the growth mechanism, we propose that in addition to the operation of the well-known vapour-liquid-solid, a step involving a sub-oxide of gallium should also be included.

[13]

Chemical vapor deposition and characterization of zinc oxide thin films and nanostructures

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Zinc oxide (ZnO), with a wide direct band gap of 3.37eV is a promising material for short-wavelength optoelectronic devices, especially for ultraviolet light-emitting diodes and laser diodes, due to advantages over GaN such as the availability of ZnO bulk single crystals and a large exciton binding energy of ~60meV. However, crystalline ZnO is naturally n-type and so far p-type doping has been difficult to achieve. A reliable method of producing good quality p-type ZnO is the major challenge of current research. In this work, the MOCVD growth of ZnO is studied using diethylzinc (DEZn) and N_2O on SiO_2/Si substrate. The structural and morphological properties of ZnO nanostructures strongly depend on growth conditions. For ZnO thin films, N doping is aimed to achieve p-type conductivity. However, the ZnO:N thin films still possess n-type conductivity, due to the compensation effect of native defects in ZnO, such as V_O and Zn_i. Luminescence from defect states in ZnO:N thin films has been studied by cathodoluminescence (CL). The transitions between nitrogen acceptors and native point defects are thought to be the origin of the unexpected blue, green and red peak positions in CL spectra.

[14]
Nano-bioimaging by Fiber-optic Nano-biosensor (FONBS) & Near-field Scanning Optical Microscope (NSOM)

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Fiber-optic nano-biosensor (FONBS) is a particular class of biosensors where the sensing elements (i.e. bioreceptor) are located at a nanometer-sized needle tip on optical fiber, which is a device used to detect a specific biological molecule, system of biological molecules, or biologically produced signal.

Near-field scanning optical microscope (NSOM) can detect structures below the diffraction limit (down to the nanometer regime) and examine the topographic and optical properties of the sample simultaneously.