Physics
AT QUEENS COLLEGE

Colloquium Notice

Patrik Hoffmann

Advanced Photonics Laboratory Swiss Federal Institute of Technology, CH-1015 Lausanne-EPFL, Switzerland

From NEAR-Field Optical probes to 3-D Photonic crystals

Optical phenomena below the diffraction limit of light have been challenging scientist with increasing importance since 1930. Photonic band-gap (PBG) structures found a strong applied research interest for telecommunication applications in the last years. PBG's could be used as potential switching and connecting units. Alternatively, PBG structures could be the access to future in-vivo Fluorescence Correlation Spectroscopy (FCS) for biomedical diagnosis, increasing the speed of several orders of magnitude. Pharmaceutical screening could also strongly be improved. The centre of the hardware of such systems is the nano-structured device embedded in connecting functional Microsystems. In this talk we focus on the comparison of flexible nano-structure fabrication methods for research and development and rapid prototyping with parallel processing methods for high throughput nano-optical device fabrication.

Focused Electron Beam (FEB) induced deposition of materials allows the extremely flexible brick by brick growth of a huge variety of structures in a serial process. The minimum "brick" size is of the order of 20 nm, and the surface roughness below 1 nm. The index of refraction of the deposit is predominantly determined by the choice of the chemical precursor and to a much less extend by the physical deposition parameters. Modified Scanning Near Field Optical Microscopy (SNOM) tips of non-spherical FEB deposits of gold nano-composite material allowed measuring frequency shifts in the transmission spectra, consistent with surface plasmon excitation calculations. Realization of photonic band-gap structures will be presented.

Parallel processing by electron beam lithography and deep reactive ion etching (DRIE) or lift-off processes that are well known from microelectronics industry have to be adapted to nano-optics, as the materials and the aspect ratio's differ strongly between the applications. 150 nm thick gold lift-off structures resulted in subwavelength confined enhanced light emission.

Monday
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Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326