NANOHOUR

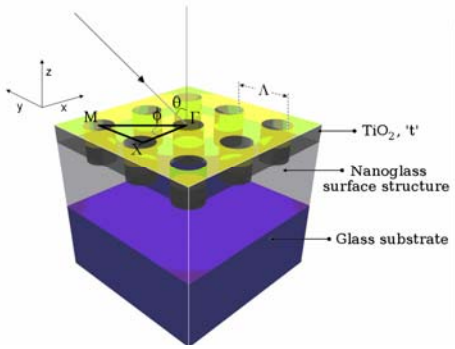
Wednesday, February 27, 2008
3:00 PM
Beckman Institute - Room 3269

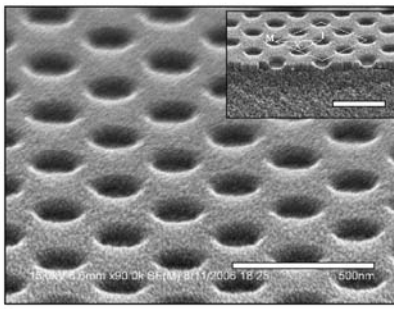
Resonant enhancement of fluorescence from quantum dots on photonic crystal slabs

Nikhil Ganesh

Graduate student in Materials Science and Engineering
with Professor Brian Cunningham

Quantum Dots have rapidly emerged as an important class of nanomaterials that promise to revolutionize a wide range of nanotechnology-enabled fields. The unique optical properties of quantum dots combined with the ability to functionalize them has made them important candidates for light sources, solar cells, optical switches and fluorescent probes in sensitive biological assays.





Two-dimensional photonic crystal slabs are a category of photonic components that allow three-dimensional control of electromagnetic radiation. In this study, we report the initial efforts at enhancement of fluorescence emission from quantum dots on the surface of two-dimensional photonic crystal slabs. The enhancement of fluorescence is achieved by the combined development of high intensity near-fields (that serve to more efficiently excite the quantum dots) and strong coherent scattering effects (that result in enhanced extraction of the emitted fluorescence), attributed to leaky photonic crystal eigenmodes. By fabricating photonic crystal slabs that operate at visible wavelengths and engineering their leaky modes to provide an overlap with the absorption and emission wavelengths of the quantum dots, we realize an enhancement of over 107 times in fluorescence intensity from quantum dots on the photonic crystal surface. We believe our results to be important towards the realization of high brightness light sources, enhanced non-linear effects and lowering the detection limits in biological applications.

Coffee and cookies will be served.

http://nanohour.beckman.uiuc.edu