Near-field Characterization of Photonic Crystal Structures using Near-field Scanning Optical Microscopy

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In the past few years photonic crystal (PC) structures have attracted much attention due to their ability to provide Interesting functionalities like sub wavelength confinement and slow light propagation. Complete understanding of the optical mode characteristics in PC structures requires full characterization of the complex optical modes inside these structures. We have demonstrated that Near-field Scanning Optical Microscopy (NSOM) can be used to measure concurrently both amplitude and phase of the Near-field modes on the top of the PC waveguide structures.

Unlike the conventional NSOM measurements where the sample is illuminated by the NSOM tip and the diffracted light is collected as an Indication of the local optical density of states (LDOS) [1] in this work the field pattern of Individual optical modes can be measured by controlling the In-plane coupling of light into the propagating modes inside the PC structure using tapered waveguides. We have investigated optical modes in PC waveguide and coupler structures on SOI (Silicon on insulator) wafer using this method.

[1] Okamoto K, Loncar M, Yoshie T, Scherer A, Applied Physics Letters **82**, 11, (2003)