

Colloquium Notice

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Silicon Microphotonics: a Tool for Electronic-Photonic Convergence and the Challenge for an On-Chip Light Source

Silicon Microphotonics is a planar integrated technology for adding optical interconnection and enhancing the signal processing capability of microelectronic chips, using the CMOS fabrication toolset. This talk will present the vision of this emerging technology and primarily focus on a critical roadblock: the absence of a silicon compatible, high quantum efficiency material with light emission in the 1~1 μ m wavelength range.

Two methodologies for dealing with this materials constraint will be introduced: (i) the design and predicted performance of an ultrahigh gain-efficiency Erbium-doped waveguide optical amplifier, designed to boost the signal power of an on off-chip laser; and (ii) the design and predicted performance of an Erbium-doped ring resonator on-chip laser.

Materials studies in high concentration Erbium-doped glasses, such as silicon nitride and silicon oxynitride, will be presented for approaches (i) and (ii). We report record optical constant values for SiON:Er and Si₃N₄:Er, and map the influence of the nitride environment on Er optical gain. Si nanostructures have been observed and characterized for optical sensitizer properties. Current impediments with these materials towards the realization of a lasing cavity will be identified.

The talk will conclude with recent work on silicon nitride/oxynitride photonic crystal structures for the design of simpler optically pumped waveguide amplifiers, and a passive device application for chip-to-optical fiber coupling of a light signal.

Monday

March 5, 2007

Starts at 12:15 PM

Coffee at 12:00 PM

Physics Conference Room, SB B326