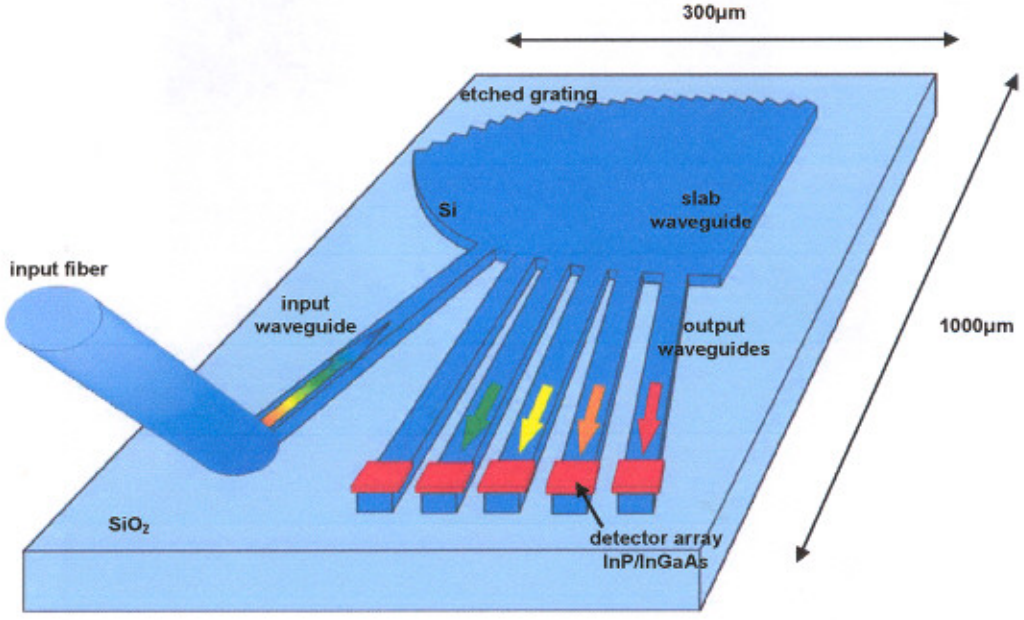
Abstract – Poster Winter School 2006

We present the design and simulation results of an integrated wavelength demultiplexer. The device's major components, which include the Silicon-on-insulator (SOI) etched diffraction grating and waveguide integrated InP/InGaAs photodetectors are discussed in this poster.

The Silicon-on-insulator diffraction grating is fabricated using standard CMOS technology. In this design, we make use of a Rowland geometry which integrates the function of a flat grating and a focal lens. Scalar diffraction theory is used to study important parameters like crosstalk and insertion loss for the different wavelength channels.

The photodetectors are heterogeneously integrated on top of the SOI waveguide circuitry. In this approach, unprocessed InP/InGaAs dies are bonded on the SOI chip using an adhesive layer (BCB, spin-on-glass). After bonding, the InP substrate is removed until the epitaxial layer stack is reached. Subsequently, the photodetectors are defined using wafer scale processes and lithographically aligned to the underlying SOI waveguides. Wafer scale processing is important to increase the reliability and decrease cost of the device.

The photo-spectrometer-on-a-chip can be used as an optical channel monitor in modern wavelength division multiplexing (WDM) telecommunications networks: it provides real-time information on system performance at the optical layer. Another application is liquid or gas sample identification based on infrared spectroscopy.



Poster Session II
Modelling and Photonic circuits

Omer Khayam: Design and optical properties of photonic crystals

Ko-Hsin Lee: Two-dimensional Photonic Crystals reduced features on InP-based materials etched using Cl2/Ar Inductive Coupled Plasma (p61)

Harm Kicken: In¯ltration of two-dimensional semi-conductor photonic crystals: methods and goals (p62)

Els Kok: Photonic crystals of InP-based rods (p63)

Jan Hendrik den Besten : 4×80 Gbit/s wavelength conversion using integrated SOAs and AWG (p64)

Ling XU: Modeling and design of a high-speed reflective transceiver for the access network (p66)

Rabah Hanfoug: Optimized design to reduce reflection in Multimode interference coupler (p68)

Peter Cristea (see Y Fedoryshyn)

Aude-Reine Bellancourt: Design, characterization and fabrication of VECSELs (p69)

Deran Maas: Simulations of Thermal Lensing in a Passively Mode-Locked Surface-Emitting Semiconductor Laser (p70)

Marco Gnan: Photonic Wire Bragg Gratings in Silicon on Insulator (p71)

Steven McMaster: Realisation of OCMDA encoding/decoding using InGaAs/InAlGaAs monolitically integrated Mach-Zehnder Interferometer Devices (p72)

Jonathan Schrauwen: Focused ion beam (p73)

Joost Brouckaert: integrated wavelength demultiplexer. (p74)

Joris Roels: Nanophotonic NEMS modulators in Silicon-on-insulator (p75)

Katrien De Vos: Label-free optical biosensor based on active and passive resonant cavities. (p76)

Tomas Lauerman: Modelling of Microresonator Based Waveguide Structures (p77)

Ziyang Zhang: Vertically Coupled Photonic Crystal Filters: Numerical Simulation and Nano-Fabrication (p78)

Amélie Têtu: Optimization of Photonic Crystal Waveguides 60° Bends in the Slow Light Regime for Broadband Transmission (p79)

Antti Säynätjoki: Characterization of photonic crystals

Michael Strain: Integrated Chirped Bragg Gratings for Dispersion Compensation (p80)

Rob van Loon: Silicon Nanocrystals and Surface Plasmons (p81)

Stephen Hegarty: Quantum-dot Phase modulator operating at 1300 nm (p82)

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