

Process Development for passive photonic circuits on BCB- bonded InP membranes on silicon

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The aim of this work is to fabricate photonic circuits in 200 nm thick InP membranes bonded with BCB on Silicon. The small thickness of these membranes allows the achievement of very small photonic devices, like MMI couplers. The light is coupled in and out through grating couplers, which have to be 70nm deep. A two-steps etch is used to achieve this purpose.

The electron-beam lithography was optimized and besides the dose optimization we found that a post bake step of the ZEP resist at 150°C after the development allowed a substantial reduction of sidewall roughness (Fig.1). Furthermore a CH₄/H₂ based ICP process was optimized and used at 200°C to perform the two-steps etching (Fig.2).

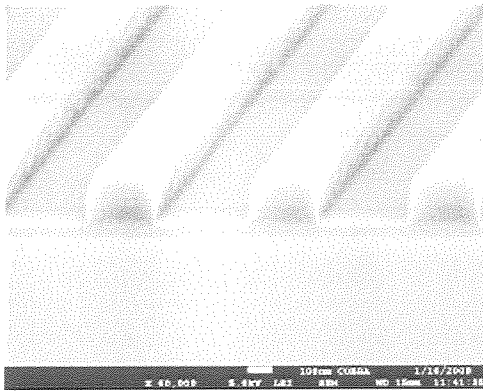


Fig.1: Morphology of the resist after a 2 minutes post bake at 150 °C

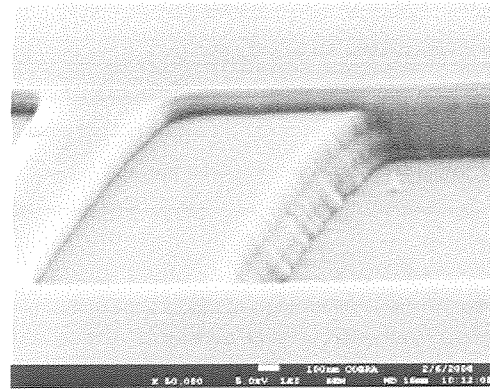


Fig.2: Morphology of the shallow-deep transition after the optimized process

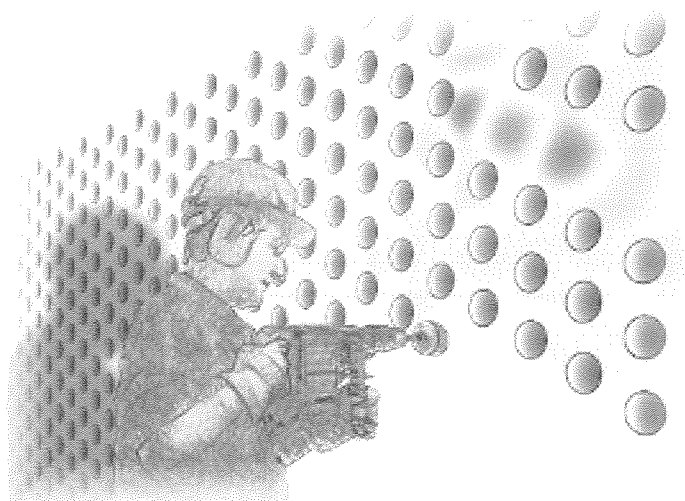
The details of the fabrication process and some transmission measurement results will be presented

SPRING SCHOOL

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ABSTRACTS OF POSTERS

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- 1. **V-Groove approach for inverted taper coupling in silicon photonics:** J. V. Galán
- 2. **Experimental Study of the Non-Linear Dynamics of Quantum-Dot InAs/InGaAsP/InP (100) Twin-Stripe Lasers Emitting at 1.5 μ m:** Jose Pozo
- 3. **InGaAs-InAlGaAs Monolithically Integrated Temporal Phase Coded OCDMA Encoder/Decoder:** S. McMaster
- 4. **A spectrally resolved study of quantum dot lasers:** G.A.P. Thé
- 5. **Carrier Transport Effects in Multi Layer Quantum Dot Lasers:** M. Rossetti
- 6. **Membrane couplers for optical interconnections on CMOS ICs:** A. Morant
- 7. **Optical Losses in Photonic Crystal Waveguides, Induced by Contact Strips for Electrical Pumping:** Peter Kaspar
- 8. **Measuring the Time-of-Flight with an optical MEMS-modulator:** Joris Roels
- 9. **InP-membrane based photodetector for optical interconnections on Si:** P.R.A. Binetti
- 10. **High bandwidth InP-based 1.55 μ m waveguide photodetector fabricated in an amplifier layer stack with active-passive integration:** L. Xu
- 11. **Design and simulation of movable micromirrors on silicon substrate:** Comanescu Florin Constantin
- 12. **Fabrication of polymer-based devices using nanoimprint technology,** Jie Teng
- 13. **Liquid crystal technology for wavelength tuning in SOI structures:** Wout De Cort
- 14. **Photonic Reservoir Computing: interconnected Semiconductor Optical Amplifiers:** Kristof Vandoorne
- 15. **Waveguide – grating photonic system analysis for sensor applications:** Roxana Ileana Rebigan
- 16. **Design Of A Monolithically Integrated All-Optical Label Swapper For Spectral Amplitude Code Labels Using Cross-Gain Modulation:** Christian Habib
- 17. **Combined Technologies: Photolithography and Electron Beam Lithography for RF Filters on GaN Development:** Herghelegiu Alexandru
- 18. **Deep dry-etched single-mode narrow waveguide for all-optical switches with InGaAs/AlAsSb quantum wells:** Ping Ma
- 19. **Assessment of mesh-interconnected integrated photonic switch circuits:** Aaron Albores Mejia
- 20. **SOI-based couplers for the transition from DPSK- to DQPSK-demodulators:** Karsten Voigt
- 21. **Adjustment of birefringence on Silicon-on-Insulator (SOI) by mechanical bending:** Georg Winzer
- 22. **Analysis of thermal crosstalk between DFB-laserdiodes on SOI:** B. Wohlfeil
- 23. **Towards optimization of Raman effect in SOI rib waveguides – compromise between linear loss and carrier lifetime:** Andrzej Gajda
- 24. **Bragg Gratings on SOI Rib Waveguides - A Comparison of Different Geometries:** Ivano Giunttoni
- 25. **Slow Light in Chalcogenide Photonic Crystals:** Marcel Spurny

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26. **A comparative study of compact electro-optic modulators based on 1D corrugated waveguide surrounded by Silicon dioxide:** Antoine Brimont
27. **Design and Fabrication of Apodised Crows on Silicon Nitride:** J.D. Domenech
28. **Silicon optical modulator:** Fengqiao Dong
29. **Large Integration Scale Circuits in SiON Technology:** Carlo Ferrari
30. **SOI photonic wires-based devices: sidewall roughness-induced losses and characterization:** Antonio Canciamilla
31. **InP Photonic Crystals bonded to SOI wires:** Yacine Halioua & Tim Karle
- 32. **Fabrication of photonic integrated circuits using high resolution CMOS fabrication process:** Shankar Kumar Selvaraja
- 33. **Silicon compatible laser based on colloidal quantum dots:** Bram De Geyter
- 34. **Al₂O₃:Er waveguide amplifiers for Si-technology compatible integrated optical applications:** L. Agazzi
- 35. **Label-free nanophotonic biosensors in silicon based on slot waveguides:** Tom Claes
36. **Design of an integrated electro-optically tunable filter for tunable laser purposes:** B.W. Tilma
37. **Sol-Gel Ormosil-on-Silicon Microphotonics:** Paulo Moreira
38. **10 Gb/s All-Optical Non-Inverted 1x4 Multi-Wavelength Conversion in a 1.55 μm QD-SOA:** J. Herrera
39. **Photonic Crystal Membrane Type Tunable Nanocavities in InP/InGaAsP:** Mehmet Ali Dundar
- 40. **Process Development for passive photonic circuits on BCB- bonded InP membranes on silicon:** F. Bordas
41. **Novel grating structures for dual-mode laser devices:** S. Ginestar
- 42. **Hybrid III-V/Silicon laser based on DVS-BCB die-to-wafer bonding:** Stevan Stankovic
43. **Fabrication of high brilliance diode lasers in the near-infrared wavelength range:** D. Feise
44. **The Nanostructuring Platform for Photonic Integration:** William Whelan Curtin
45. **Design of a reconfigurable optical interconnect for large-scale multiprocessor networks:** Iñigo Artundo
46. **Photonic crystal waveguides with ring-shaped holes on silicon-on-insulator:** A. Säynätjoki
47. **Towards optimizing photonic crystal cavities for Quantum Dot coupling:** Khaled Mnaymneh
48. **Quantum Confined Stark Effect (QCSE) Tuned Lasers:** Francesca Pozzi
49. **Multi-waveguide based collector array for the detection of backscattered light from highly scattering media:** N. Ismail
50. **Continuous wave InGaAsP/InP Fabry-Perot lasers on silicon:** Tiphaine Dupont