

CONGSHAN WAN

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EDUCATION

Georgia Institute of Technology, Atlanta, GA	Jan 2015 - May 2019
Doctor of Philosophy in Department of Electrical & Computer Engineering	GPA: 4.00/4.00
Georgia Institute of Technology, Atlanta, GA	Aug 2013 - Dec 2014
Master of Science in Department of Materials Science & Engineering	GPA: 3.62/4.00
University of Illinois at Urbana-Champaign, Urbana, IL	Aug 2009 - May 2013
Bachelor of Science (with honor) in Department of Materials Science & Engineering	GPA: 3.85/4.00

RESEARCH EXPERIENCE

Graduate Research Assistant, ECE, Georgia Tech	Advisors: T. K. Gaylord and M. S. Bakir	Jan 2015 - Present
<i>Project 1: Efficiency Optimization and Angular Misalignment Analysis of Interlayer Grating Couplers for 2.5D/3D Integrated Photonics</i>		
<ul style="list-style-type: none">Proposed a new simulation method based on the rigorous coupled-wave analysis (RCWA-EIS) to accurately calculate the coupling efficiency of interlayer grating couplers with various profiles and analyze the effects of angular misalignmentsDemonstrated a grating optimization tool based on Matlab optimization functions and the RCWA-EIS method, which is more computationally efficient than commercial software based on FDTD (Lumerical) or FEM (Comsol) method		
<i>Project 2: Design and Fabrication of Grating-Assisted-Cylindrical-Resonant-Cavities (GARC) Inter-layer Couplers for 2.5D/3D Integrated Photonics</i>		
<ul style="list-style-type: none">Invented a new type of interlayer optical coupler (GARC) based on cylindrical resonant cavities and circular gratings to achieve efficient and broadband interlayer coupling, which is disclosed in U.S. Patent Application No. 62/557,240Simulated and optimized the GARC couplers using MEEP FDTD and verified by Lumerical FDTDMicrofabricating the designed GARC coupler using cleanroom facilities, and measuring the interlayer coupling efficiency and the spectral response using a setup consisting of IR tunable laser, polarizer, lock-in amplifier and photodetector		
<i>Project 3: Design and Fabrication of Self-Aligned Fiber Alignment Fixture for Easier Integration</i>		
<ul style="list-style-type: none">Fabricating a novel multiple-use self-aligned fiber alignment fixture to achieve easy vertical or butt couplingAligning the fiber/fiber arrays to the gratings/waveguides and measuring the coupling efficiencies and repeatability		
Graduate Research Assistant, MSE, Georgia Tech	Advisor: Z. Lin	Aug 2013 - Dec 2014
<i>Project: Core-shell Nanoparticle Synthesis Using Atomic Transfer Radical Polymerization (ATRP)</i>		
<ul style="list-style-type: none">Constructed COMSOL model (FEM) of Au/TiO₂ nanoparticles and performed surface plasma resonance analysisSynthesized block-copolymer chains on star-like micro-initiators as bi-phased and spherical nanoparticle scaffolds		
Undergraduate Research Assistant, MSE, UIUC	Advisor: J. Rogers	Aug 2010 - May 2013
<i>Project: Single-Walled Carbon Nanotube (SW-CNT) Synthesis and Transistor Fabrication</i>		
<ul style="list-style-type: none">Fabricated FeO catalyst lines by microfabrication techniques and produced CNTs by chemical vapor depositionIntegrated semiconducting CNTs as channels in transistors and tested I-V characteristics by the probe station		
Undergraduate Senior Design, MSE, UIUC	Advisor: M. Shim	Jan 2013 - May 2013
<i>Project: Flexible/Wearable QLED Display Integration and Testing</i>		
<ul style="list-style-type: none">Sandwiched self-assembled CdSe quantum dot monolayer between TFB (with PEDOT:PSS) HTL and ZnO nanoparticle ETL, which was then encapsulated by ITO coated parylene-epoxy and transferred to a flexible polyimide substrateMeasured the PL of the quantum dot layer and J-V-L, EL and EQE characteristics of the QLED		

INTERNSHIP EXPERIENCE

Summer Intern, OFS Fitel LLC	Advisor: D. Peckham	May 2017 - Aug 2017
<i>Project: Dopant Diffusion Modeling and Fiber Testing</i>		
<ul style="list-style-type: none">Developed dopant diffusion models for fiber D_2 treatment and reaction-limited process using MatlabConducted microbending/macrobending test and OTDR test on single-mode fibers and SCUBA fibers		

- Improved fusion splicing recipes for single-mode fibers, submarine SCUBA fibers and terrestrial ULL fibers

Summer Intern, Institute of Microelectronics at Chinese Academy of Science

June 2011 - Aug 2011

Project: Fabrication and Testing of Resistive-Switching Nonvolatile Memory RRAM

- Deposited TaO_x thin films by reactive RF magnetron sputtering using a Ta target in oxygen ambient and controlled oxygen profile of TaO_x by annealing in oxygen
- Investigated the oxidation-reduction mechanism of RRAM's conducting channel and measured channel resistances, I-V curves and set/reset currents

PUBLICATIONS

Journal Papers:

- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "Grating design for interlayer optical interconnection of in-plane waveguides," Appl. Opt. vol. 55, no. 10, pp. 2601-2610, 2016. **Featured on the journal cover** (Ph.D. Project 1)
- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "RCWA-EIS method for interlayer grating coupling," Appl. Opt. vol. 55, no. 22, pp. 5900-5908, 2016. (Ph.D. Project 1)
- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "Rigorous coupled-wave analysis equivalent-index-slab method for analyzing 3D angular misalignment in interlayer grating couplers," Appl. Opt. vol. 55, no. 35, pp. 10006-10015, 2016. (Ph.D. Project 1)
- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "Circular waveguide grating-via-grating for interlayer coupling," IEEE Photon. Technol. Lett., vol. 29, no. 21, pp. 1776-1779, 2017. (Ph.D. Project 2)
- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "Grating-assisted-cylindrical-resonant-cavities interlayer coupler," Appl. Opt. vol. 57, no. 18, pp. 5079-5089, 2018. (Ph.D. Project 2)
- X. Pang, **C. Wan**, M. Wang, and Z. Lin, "Strictly biphasic soft and hard Janus structures: synthesis, properties, and applications," Angew. Chem. Int. Ed., vol. 53, no. 22, pp. 5524-5538, 2014. (M.S. Project)

Book Chapter:

- M. Zia, **C. Wan**, Y. Zhang, and M. S. Bakir, "Electrical and photonic off-chip interconnection and system integration," in *Optical Interconnects for Data Centers*, T. Tekin, R. Pitwon, A. Hakansson, and N. Pleros. (Elsevier, 2016), pp. 265-283.

Conference Proceedings:

- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "Grating design for 3-D interconnections of waveguides in overlaid chips using the RCWA-EIS method," in *Frontiers in Optics* (Optical Society of America, 2016), paper JW4A. 127.
- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "Waveguide grating couplers in overlaid chips: efficiency optimization and angular misalignment simulation," in *Frontiers in Optics* (Optical Society of America, 2017), paper JW4A. 94.
- **C. Wan**, T. K. Gaylord, and M. S. Bakir, "Si/SiO₂ interlayer coupler based on cylindrical resonant cavities," in *IEEE Research and Applications of Photonics In Defense Conference* (IEEE, 2018), invited.

Intellectual Property:

- Circular waveguide grating-via-grating for interlayer coupling, U.S. Patent Application No. 62/557,240.

Master Thesis:

- Functional Nanoparticles: Synthesis and Simulation, Georgia Institute of Technology, 2014.

TECHNICAL STRENGTHS

Software and Programming Skills:

Matlab, LabVIEW, COMSOL, Lumerical (FDTD, MODE, DEVICE, INTERCONNECT), MEEP FDTD, Zemax, SAS JMP, ANSYS, Autocad, Solidworks, GenSys BEAMER, Latex, InDesign, PhotoShop, Illustrator, C and C++, Java

Electromagnetic/Optoelectronics Theory and Devices:

Fourier optics, diffractive optics, geometric optics, integrated photonics, passive components (waveguide, fiber, grating, coupler, splitter, resonator, interferometer, etc.), active components (laser, photodetector, modulator, amplifier, multiplexer, switch, etc.), gratings for AR glasses, spatial light modulator (MEMS, liquid crystal) for 3D electro-holography

Electromagnetic Simulation Skills:

Finite-difference time-domain, finite element method, rigorous coupled-wave analysis, beam propagation method

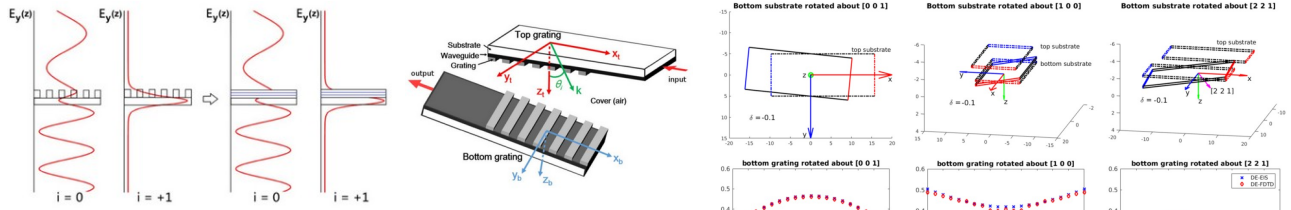
Microfabrication and Microscopy Techniques:

Lithography (UV, laser and e-beam), mask alignment, e-beam evaporation, CVD (PECVD, LPCVD), ALD, RIE (ICP), oxygen plasma treatment, sputtering, transfer printing, liftoff, SEM, ATM, TEM

PROJECT OVERVIEW

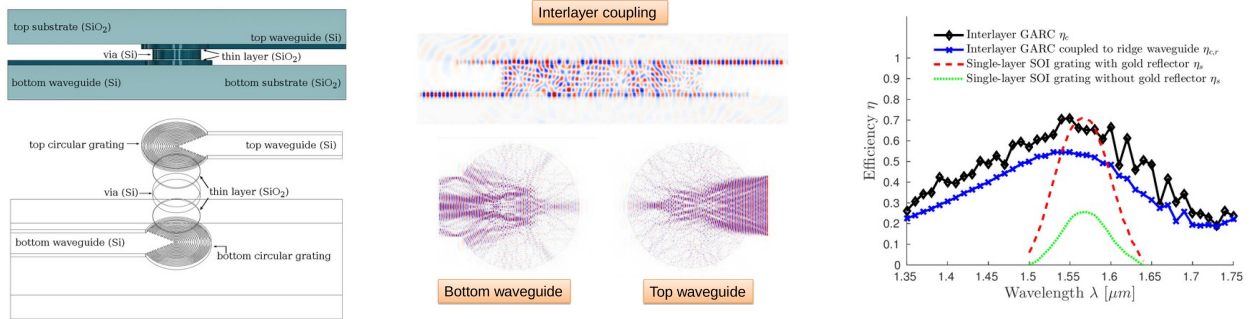
Please visit <https://congshanwan.github.io> for movies.

Project 1: Efficiency Optimization and Angular Misalignment Analysis of Interlayer Grating Couplers



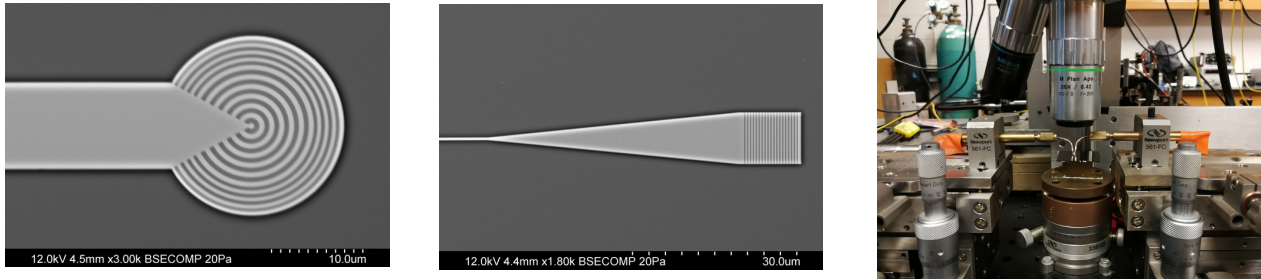
New “equivalent-index-slabs” concept to assist rigorous coupled-wave analysis (RCWA) in analyzing waveguide gratings involving surface waves and angular misalignment. Code implemented in Matlab.

Project 2: Design of Grating-Assisted-Cylindrical-Resonant-Cavities (GARC) Interlayer Couplers

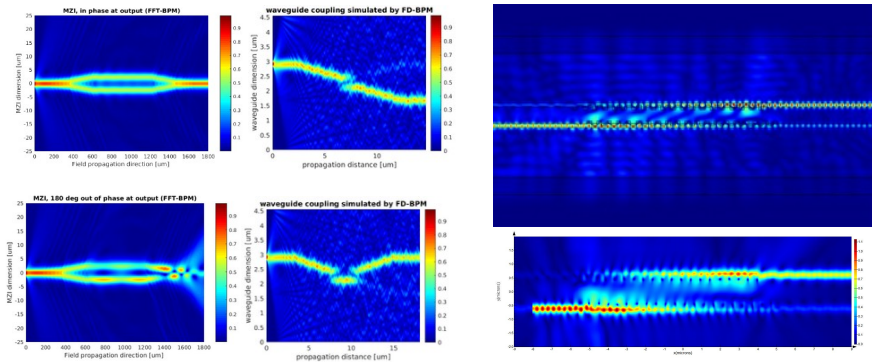


Fundamentally new interlayer coupler to achieve efficient and broadband coupling. Simulated by MEEP 3D FDTD.

Project 3: Fabrication and Testing of Rectangular Fiber Grating Coupler and GARC Coupler



Side Projects: FDTD, FEM, and BPM Simulations



Self-coded FFT-BPM and FD-BPM

COMSOL FEM (top) and Lumerical FDTD solutions (bottom)

Previous Project: CNT FET and QLED

