Kar Wei NG

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SUMMARY

Currently an assistant professor at the Institute of Applied Physics and Materials Engineering, Faculty of Science, University of Macau. Specialized in the growth and material characterization of III-V compound semiconductor monolithically integrated with silicon. Acquired nearly 10 years of experience in metalorganic chemical vapor deposition (MOCVD) growth of III-V nanostructures and thin films. Experienced in various materials characterization techniques like transmission electron microscopy, X-ray diffraction, etc. For more details, please visit https://sites.google.com/site/eeepsdng/

EDUCATION

University of California, Berkeley

- *Doctor of Philosophy* in Engineering with a Designated Emphasis in Nanoscale Science and Engineering
  Sep 08 – Dec 13

Hong Kong University of Science and Technology (HKUST)

- *Master of Philosophy* in Electrical and Electronic Engineering
  Sep 04 – May 07
- *Bachelor of Engineering* in Electronic Engineering
  Sep 01 – Jun 04 ***First Class Honors***

PROFESSIONAL EXPERIENCE

Jan 16 – **University of Macau**
Assistant Professor, Institute of Applied Physics and Materials Engineering

- *Academic research* in optoelectronics and piezoelectric materials
- Teaching UG and PG classes including PHYS 111 and APME 822

Dec 14 – Dec 15 **Taiwan Semiconductor Manufacturing Company**
Principal Engineer

- Epitaxial growth and optical metrology developments

Mar 14 – May 14 **Hong Kong University of Science and Technology**
Visiting Scholar

- Investigate the growth of InP on patterned silicon substrate
- Explore various techniques for fabricating nano-patterned substrates

Jun 12 – Aug 12 **Sumitomo Electric**
Summer Intern

- Failure analysis of InP-based epitaxy utilizing high-resolution transmission electron microscopy (HRTEM), z-contrast imaging, energy dispersive X-Ray spectroscopy, etc.

Sep 08 – Jan 14 **University of California, Berkeley**
Graduate student Researcher

- MOCVD growth of GaAs-based nanolaser on various substrates, including crystalline and polycrystalline silicon, for integration of optoelectronics and Si-based technologies
- Material development of InP-based nanostructure solar cell monolithically grown on Si substrate
- Material characterization with HRTEM and scanning transmission electron microscopy (STEM) analysis, utilizing focus ion beam (FIB) for site specific lamella preparation and micromanipulation
- Collaborated with staff scientists at the national center for electron microscopy (NCEM) at Lawrence Berkeley National Lab (LBNL) and developed special techniques

in lifting out single nano-needle for atomic resolution 3D tomography with transmission electron aberration corrected microscope (TEAM-I)
Electron beam induced current (EBIC) analysis to study carrier transport in nanostructures

Jun 07 – Jul 08 **Hong Kong University of Science and Technology**
Research Assistant
- Investigation of GaN based Green LED degradation over time
- Growth optimization and characterization of GaN grown on silicon substrate

Sep 04 – Jul 07 **Hong Kong University of Science and Technology**
Postgraduate student
- MOCVD growth of GaN based LED on sapphire and silicon substrates
- Material characterization via various techniques, including TEM, X-ray diffraction, atomic force microscopy (AFM) and secondary ion mass spectroscopy (SIMS)

AWARDS AND SCHOLARSHIPS

2013	UC Berkeley Outstanding Graduate Student Instructor Award
2012	Best Poster Award (Honorable Mention), International Nano-Optoelectronic Workshop (iNOW), Berkeley & Palo Alto, 2012
2010	Best Poster Award (3rd place), International Nano-Optoelectronic Workshop (iNOW), Beijing & ChangChun, 2010
2005	Sumida and Ichiro Yawata Foundation Scholarship
2005	Silver Award for volunteer Service
2004	Hong Kong University of Science and Technology Academic Achievement Award • **Top 16 graduating students in the university in the academic year**
2001-2004	The Hong Kong Jockey Club Scholarships • **Triple receptions**
2002-2004	The Hongkong Electric Co Ltd Scholarships • **Triple receptions**

SKILLS AND LANGUAGE

Computer Skills	Proficiency in MS Office, Origin, Digital Micrograph and ImageJ
Language	Fluent in English, Mandarin and Cantonese. Elementary in Japanese.

PUBLICATIONS

Journal

1. K Li*, **K. W. Ng***, T. T. D. Tran, H. Sun, F. Lu, C. J. Chang-Hasnain "Wurtzite-phased InP micropillars grown on silicon with low surface recombination velocity" *Nano Letters* 15 (11), 7189-7198 (2015) (Authors with * are co-first authors).
2. W. Yang, S. A. Gerke, **K. W. Ng**, Y. Rao, C. Chase, C. J. Chang-Hasnain, "Laser Optomechanics" Accepted by *Scientific Reports*.
3. W. S. Ko, T. T. D. Tran, I. Bhattacharya, **K. W. Ng**, H. Sun, C. J. Chang-Hasnain "Illumination angle insensitive single indium phosphide tapered nanopillar solar cell" *Nano Lett*, 15 (8), pp 4961–4967 (2015).
4. B. Shi, Q. Li, Y. Wan, **K. W. Ng**, X. Zou, C. W. Tang, K. M. Lau "InAlGaAs/InAlAs MQWs on Si Substrate" *Photonics Tech L*, IEEE 27 (7), 748-751 (2015)
5. Q. Li, **K. W. Ng**, K. M. Lau "Growing antiphase-domain-free GaAs thin films out of highly ordered planar nanowire arrays on exact (001) silicon" *Appl. Phys. Lett.* 106 (7), 072105 (2015).
6. R. Chen*, **K. W. Ng***, W. S. Ko*, D. Parekh, F. Lu, T. T. D. Tran, K. Li, C. J. Chang-Hasnain, "Nanophotonic integrated circuits assembled from nanoresonators grown on silicon" *Nature Communications* 5, 4325 (2014) (Authors with * are co-first authors)

7. X. Wang, I. Zardo, D. Spirkoska, S. Yazji, **K. W. Ng**, W. S. Ko, C. J. Chang-Hasnain, J. J. Finley, G. Abstreiter, "Valence Band Splitting in Wurtzite InGaAs Nanoneedles Studied by Photoluminescence Excitation Spectroscopy" *ACS nano* 8 (11), 11440-11446 (2014).
8. Q. Li, **K. W. Ng**, C. W. Tang, K. M. Lau, R. Hill, A. Vert, "Defect reduction in epitaxial InP on nanostructured Si (001) substrates with position-controlled seed arrays" *J. Cryst. Growth* 405, 81-86 (2014).
9. **K. W. Ng**, W. S. Ko, R. Chen, F. Lu, T. T. D. Tran, K. Li, C. J. Chang-Hasnain, "Composition Homogeneity in InGaAs/GaAs Core–Shell Nanopillars Monolithically Grown on Silicon" *ACS applied materials & interfaces* 6 (19), 16706-16711 (2014).
10. T. T. D. Tran, R. Chen, **K. W. Ng**, W. S. Ko, F. Lu, C. J. Chang-Hasnain, "Three-dimensional whispering gallery modes in InGaAs nanoneedle lasers on silicon" *Appl. Phys. Lett.* 105 (11), 111105 (2014).
11. **K. W. Ng**, W. S. Ko, F. Lu, C. J. Chang-Hasnain "Metastable Growth of Pure Wurtzite InGaAs Microstructures" *Nano Lett* 14 (8), 4757-4762 (2014).
12. H. Sun, F. Ren, **K. W. Ng**, T. Tran, K. Li, C. J. Chang-Hasnain, "InGaAs Nanopillar Lasers Directly Grown on Silicon with Heterostructure Surface Passivation" *ACS Nano,* 8 (7), 6833–6839 (2014).
13. T. T. D. Tran, H. Sun, **K. W. Ng**, F. Ren, K. Li, F. Lu, E. Yablonovitch, C. J. Chang-Hasnain "High Brightness InP Micropillars Grown on Silicon with Fermi Level Splitting Larger than 1 eV" *Nano Lett.,* , 14 (6), pp 3235–3240 (2014).
14. H. Sun, **K. W. Ng**, F. Ren, T. Tran, K. Li, C. J. Chang-Hasnain, "First Observation of Composition Ordering Wurtzite-Phase InGaP Nanoneedle Lasers Grown on Silicon" Submitted to *Nature Communications.*
15. K. Li, H. Sun, F. Ren, **K. W. Ng**, T. Tran, R. Chen, C. Chang-Hasnain, "Tailoring the Optical Characteristics of Microsized InP Nanoneedles Directly Grown on Silicon" *Nano Lett* 14, 183–190 (2014).
16. **K. W. Ng**, T. T. D. Tran, W. S. Ko, R. Chen, F. Lu, C. J. Chang-Hasnain, "Single Crystalline InGaAs Nanopillar Grown on Polysilicon with Dimensions beyond the Substrate Grain Size Limit" *Nano Lett* 13 (12), 5931-5937 (2013).
17. M. V. Nazarenko, N. V. Sibirev, **K W. Ng**, F. Ren, W. S. Ko, V. G. Dubrovskii, C. Chang-Hasnain, "Elastic energy relaxation and critical thickness for plastic deformation in the core-shell InGaAs/GaAs nanopillars" *J Appl Phys* 113 (10), 104311 (2013).
18. F. Ren, **K. W. Ng**, K. Li, H Sun, C. J. Chang-Hasnain, "High-quality InP nanoneedles grown on silicon" *Appl Phys Lett* 102 (1), 012115 (2013).
19. **K. W. Ng**, W. S. Ko, T. T. D. Tran, R. Chen, M. V. Nazarenko, F. Lu, V. G. Dubrovskii, M. Kamp, A. Forchel and C. Chang-Hasnain, " Unconventional Growth Mechanism for Monolithic Integration of III-V on Silicon," *ACS Nano* 7 (1), 100-107 (2013).
20. F. Lu, T. T. D. Tran, W. S. Ko, **K. W. Ng**, R. Chen, C Chang-Hasnain, "Nanolasers grown on silicon-based MOSFETs" *Opt Express* 20 (11), 12171-12176 (2012).
21. V. G. Dubrovskii, M. V. Nazarenko, L. C. Chuang, W. S. Ko, **K. W. Ng**, C Chang-Hasnain, "Growth kinetics of GaAs nanoneedles on silicon and sapphire substrates" *Appl Phys Lett* 98 (15), 153113 (2011).
22. L. C. Chuang, M. Moewe, **K. W. Ng**, T. T. D. Tran, S Crankshaw, R. Chen, W. S. Ko, C Chang-Hasnain, "GaAs nanoneedles grown on sapphire" *Appl Phys Lett* 98 (12), 123101 (2011).
23. R. Chen, T. T. D. Tran, **K. W. Ng**, W. S. Ko, L. C. Chuang, F. G. Sedgwick, C Chang-Hasnain, "Nanolasers grown on silicon" *Nature Photonics* 5 (3), 170-175 (2011).
24. L. C. Chuang, F. G. Sedgwick, R. Chen, W. S. Ko, M. Moewe, **K. W. Ng**, T. T. D. Tran, C Chang-Hasnain "GaAs-based nanoneedle light emitting diode and avalanche photodiode monolithically integrated on a silicon substrate" *Nano Lett* 11 (2), 385-390 (2011).
25. H. Wang, H. Liang, Y. Wang, **K. W. Ng**, D. Deng, K. M. Lau, "Effects of AlGaN/AlN Stacked Interlayers on GaN Growth on Si (111)" *Chinese Phys Lett* 27 (3), 038103 (2010)
26. N. S. Yu, Y. Wang, H. Wang, **K. W. Ng**, K. M. Lau, "Improved GaN grown on Si (111) substrate using ammonia flow modulation on SiN_x mask layer by MOCVD" *Sci Cina Ser E* 52 (9), 2758-2761 (2009)

27. M. Moewe, L. C. Chuang, S Crankshaw, **K. W. Ng**, C. Chang-Hasnain, "Core-shell InGaAs/GaAs quantum well nanoneedles grown on silicon with silicon-transparent emission" *Opt Express* 17 (10), 7831-7836 (2009).
28. **K. W. Ng**, J. M. Hwang, K. M. Lau, "Growth and Characterizations of GaN-Based LEDs Grown on Wet-Etched Stripe-Patterned Sapphire Substrates" *J. Electronic Materials* Vol. 37, No. 10, 1560-1564 (2008)
29. Y. J. Lee, H. C. Kuo, T. C. Lu, S. C. Wang, **K. W. Ng**, K. M. Lau, Z. P. Yang, A. S. P. Chang, S. Y. Lin, "Study of GaN-based light-emitting diodes grown on chemical wet-etching-patterned sapphire substrate with V-shaped pits roughening surfaces" *J Lightwave Technol* 26 (11), 1455-1463 (2008).
30. B. Zhang, H. Liang, Y. Wang, Z. Feng, **K. W. Ng**, K. M. Lau, "High-performance III-nitride blue LEDs grown and fabricated on patterned Si substrates" *J cryst growth* 298, 725-730 (2007).

Conference

31. W. S. Ko, R. Chen, F. Lu, **K. W. Ng**, K. Li, T. T. D. Tran, and C. Chang-Hasnain, "III-V Nanopillar Light Emitting Diode with Amplified Spontaneous Emission Monolithically Grown on Silicon Substrate," (oral presentation) in TECHCON 2013 Conference, paper 16.7, Austin, September 2013
32. T. Tran, H. Sun, F. Ren, **K. W. Ng**, K. Li, F. Lu, E. Yablonovitch, C. J. Chang-Hasnain, "High Brightness InP Micropillars Grown on Silicon with Fermi-level Splits Larger than 1 eV," (oral presentation) in 39th IEEE Photovoltaic Specialist Conference, paper 237, June 2013
33. H. Sun, F. Ren, T. Tran, **K. W. Ng**, K. Li, C. J. Chang-Hasnain, "High quality InGaP micropillars directly grown on silicon" IEEE Photonics Society Summer Topical Meeting Series, 50-51 (2013).
34. **K. W. Ng**, W. S. Ko, T. T. D. Tran, R. Chen, F. Lu, C. J. Chang-Hasnain, M. V. Nazarenko, V. G. Dubrovskii, M. Kamp, A. Forchel, "Sub-Micron Growth of InGaAs/GaAs Core-Shell Pillars on Silicon," (oral presentation) in International Symposium on Compound Semiconductors (ISCS), paper Tu-2B.4, Santa Barbara, August 2012.
35. K. Li, F. Ren, R. Chen, T. Tran, **K. W. Ng**, C. J. Chang-Hasnain, "Characteristics of InP nanoneedles grown on silicon by low-temperature MOCVD" International Conference on Indium Phosphide and Related Materials (IPRM), Paper Tu-1D.3 (2012)
36. F. Lu, K. Li, **K. W. Ng**, W. S. Ko, and C. Chang-Hasnain, "The Nanopillar Lasers: Enabling Monolithic Integration with Si-Photonics", (oral presentation) in International Symposium on Compound Semiconductors (ISCS), paper Mo-1A.5, Santa Barbara, August 2012.
37. R. Chen, D Parekh, **K. W. Ng**, C Chang-Hasnain, "High-speed avalanche photodiodes using III–V nanopillars monolithically grown on silicon" Group IV Photonics (GFP), IEEE 9th International Conference on, 48-50 (2012).
38. **K. W. Ng** "High quality mismatched growth of sub-micron InGaAs/GaAs core-shell pillars on Silicon" Electronic Materials Symposium, Santa Clara, April 2012.
39. T. T. Tran, R. Chen, **K. W. Ng**, W. S. Ko, F. Lu, C. J. Chang-Hasnain, "Helically Propagating Modes in InGaAs Nanoneedle Lasers Grown on Poly-Silicon and Silicon Substrates" (oral presentation) in Conference on Lasers and Electro-Optics (CLEO), paper CTuR3, Baltimore, May 2011.
40. F. Lu, T. T. D. Tran, W. S. Ko, **K. W. Ng**, R. Chen, C. J. Chang-Hasnain, "Nanolasers on Si-MOSFET: A Monolithic Integration" (oral presenation) in Conference on Lasers and Electro-Optics (CLEO), paper CMO2, Baltimore, May 2011
41. **K. W. Ng**, W. S. Ko, R. Chen, T. T. D. Tran, F. Lu, L. C. Chuang, F. G. Sedgwick, C. J. Chang-Hasnain, "Nanolasers grown on polycrystalline silicon" (oral presenation) in IEEE Photonics Society 23rd annual meeting, Denver, CO, USA, November 7-11 (2010).
42. **K. W. Ng**, L. C. Chuang, T. T. D. Tran, W. S. Ko, M. Moewe, R. Chen, C. Chang-Hasnain, "Wurtzite GaAs Nanoneedles Epitaxially Grown on Highly Lattice-Mismatched Sapphire with Bright Luminesence" (oral presenation) in International Conference on Metal Organic Vapor Phase Epitaxy 2010, Lake Tahoe, NV, USA

43. R. Chen, T. T. D. Tran, **K. W. Ng**, W. S. Ko, L. C. Chuang, F. G. Sedgwick, C. J. Chang-Hasnain, "All-semiconductor nanolasers on silicon" IEEE Photonics Society, 23rd Annual Meeting of the, 473-474 (2010).
44. R. Chen, T. T. D. Tran, **K. W. Ng**, W. S. Ko, L. C. Chuang, F. G. Sedgwick, C Chang-Hasnain, "As-Grown InGaAs Nanolasers for Integrated Silicon Photonics" Integrated Photonics Research, Silicon and Nanophotonics, paper PDIWI2 (2010).
45. L. C. Chuang, R. Chen, F. G. Sedgwick, W. S. Ko, **K. W. Ng**, T. T. D. Tran, C Chang-Hasnain, "InGaAs QW nanopillar light emitting diodes monolithically grown on a Si substrate" Conf. on Lasers and Electro-Optics (CLEO), San Jose, CA, paper CMFF6, May 16- 21 (2010).
46. L. C. Chuang, C Chase, M. Moewe, **K. W. Ng**, S Crankshaw, C Chang-Hasnain, "GaAs nanoneedle photodetector monolithically grown on a (111) Si substrate by MOCVD" Conference on Lasers and Electro-Optics (CLEO), paper CTuV4 (2009).

Workshop

47. W. S. Ko, F. Lu, B. A. Aguirre, **K. W. Ng**, T. T. D. Tran, D. Zubia, Connie Chang-Hasnain, "Selective Area Growth of InP Nanopillars on Silicon," Center for Energy Efficient Electronics Science Retreat, Berkeley, 2013.
48. **K. W. Ng**, W. S. Ko, T. T. D. Tran, R. Chen, M. V. Nazarenko, F. Lu, V. G. Dubrovskii, M. Kamp, A. Forchel, and C. Chang-Hasnain, "Novel Growth Mechanism for Monolithic Integration of III-V on Silicon," (Honorable Mention) International Nano-Optoelectronic Workshop (iNOW), Berkeley & Palo Alto, 2012.
49. F. Lu, Kun Li, **K. W. Ng**, W. S. Ko, C. Chang-Hasnain, "Nanopillar Lasers: Enabling Monolithic Integration with Si-Photonics," (Second Place Best Poster Award) International Nano-Optoelectronic Workshop (iNOW), Berkeley & Palo Alto, 2012.
50. **K. W. Ng**, W. S. Ko, T. T. D.Tran, R. Chen, F. Lu and C. Chang-Hasnain, "Catalyst-free Nanolasers Grown on Polycrystalline Silicon," International Nano-Optoelectronic Workshop (iNOW), Beijing, 2010.