# Guangxu Ju


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## Education

2009-2012 Ph.D in Crystalline Material Science, **Nagoya University**, Japan
2007-2009 M.Sc. in Materials Science, **Harbin Institutes of Technology**, China
2002-2006 B.Sc. in Polymer Physics and Chemistry, **Heilongjiang University**, China

## Advisors

Dr. **G. Brian Stephenson** (Argonne Distinguished Fellow and Synchrotron Radiation Studies group leader)
Prof. **Hiroshi Amano** (2014 Physics Nobel prize, Nagoya University)
Prof. **Yoshikazu Takeda** (Director of Aichi Synchrotron Radiation Center, Nagoya University)
Prof. **Jie Yu** (Harbin Institutes of Technology)

## Research Experience

*Current* **Argonne National Laboratory**, USA, *Postdoctoral scholar*, Material Science Division

2014
- Researched the properties of extremely thin nucleation layers and follow the structural evolution of strain and roughness in the AlN layer from an initial nucleation layer to a fully relaxed film; To reveal the evolution of the crystal structure, dislocation behavior, and surface and interface roughness during heteroepitaxial growth of a large lattice mismatch system.
- Developed an instrument for in-situ coherent X-ray studies of metal-organic vapor phase epitaxy (MOVPE) of III-nitrides;
- Applying coherent x-ray techniques (surface x-ray photon correlation spectroscopy (XPCS)) to observe the atomic-scale dynamics during growth; enhancing fundamental understanding MOVPE growth mechanism and allow development of improved synthesis and interface science for nitride materials.
- Researched the homoepitaxial growth on patterned GaN substrate and the growth mode on semi-polar GaN.

2012-2014 **Nagoya University**, Japan, *Research staff*, Department of Electrical Engineering and Computer Science
- Researched the interface of GaN/InGaN heterostructure during MOVPE growth;
- Developed a fixed angle x-ray reflectivity to realize *real time* monitoring of surface roughness and strain relaxation during InGaN/GaN heteroepitaxial growth;
- Researched the role of threading dislocations in strain relaxation during GaInN growth monitored by *real time* x-ray reflectivity.

2010-2012 **Nagoya University**, Japan, *Research Assistant*, Department of crystalline material science
Studied the structural properties of semiconductor heterostructures by in-situ x-ray monitoring and ex-situ characterizations.

2008-2009 **Harbin Institutes of Technology**, China, Department of material science,
Fabrication and characterization of boron carbonitride nanofibers by electrospinning

2005-2006 **Heilongjiang University**, China, Department of chemistry, chemical engineering and materials,
Performed experimental studies on polymer physics and chemistry.

## Teaching Experience

2012-2014 **Nagoya University**, Japan, *Graduate Student Instructor*
Instructed labs, teaching PhD students to grow samples by MOVPE and x-ray characterizations.

2008-2009 **Harbin Institutes of Technology**, China, *Undergraduate Student Instructor*
Held office hours for 40 students and graded homework and exams.

## Professional Profile

- **Peer Reviewer for 5 journals**: Materials Science in Semiconductor Processing, Chinese Optics Letters, Journal of Applied Physics, Journal of Physics D: Applied Physics, Measurement Science and Technology.
- **1 patent**.
- **17 articles (12 first-author)**, including Physics Review Letter (1),Physics Review B (1), Applied Physics Letter (3), Journal of Applied Physics (2), Japanese Journal of Applied Physics (1), Journal of Crystal Growth (4), Review of Scientific Instruments (1), Journal of Synchrotron Radiation (1).
- **International conferences**, including 3 invited talks, 11 contributed talks, and 4 posters

- **Membership**: the Japan Society of Applied Physics (JSAP) and Material Research Society (MRS)

## Areas of Expertise

*In-situ x-ray and laser studies of materials processing, characterization, and properties; x-ray scattering for surface evolution during epitaxial thin films; exploring the buried interfaces with advanced x-ray techniques; development of in-situ x-ray and laser techniques; MOVPE and reactive magnetron sputtering thin film growth of wide band gap semiconductors; optical and electronic properties of the semiconductors;*

## Patent

**Chinese Patent, CN200820089873.4**, Guangxu Ju, Wei Yang, Yanhong Zhang, Zewen Li, "Connector of continuous sucker rod of impact resistance composite material".

## Publication list

### In preparation

1. **Guangxu Ju**, M.J. Highland, J.A. Eastman, Rebecca Sichel-Tissot, P.M. Baldo, Peter Zapol, Carol Thompson, and P.H. Fuoss, "In-Situ X-ray Characterizations of Initial Nucleation of AlN grown on Sapphire (0001) during Reactive Radiofrequency Sputtering", *Applied Physics Letter*, (2017).
2. **Guangxu Ju**, Matthew Highland, Carol Thompson, Jeffrey A. Eastman, Paul H. Fuoss, Hua Zhou, Roger Dejus, and G. Brian Stephenson, "Coherence Characterization of APS Beamline 12ID-D", *Journal of Synchrotron Radiation*, (2017).
3. **Guangxu Ju**, Dongwei Xu, M.J. Highland, J.A. Eastman, Carol Thompson, P.H. Fuoss, Andrew Ulvestad, Peter Zapol, Hua zhou and G. Brian Stephenson, "Observation of Island Arrangement Persistence During Layer-by-Layer Growth", *Physical Review Letters*, (2017).
4. **Guangxu Ju**, Brian Stephenson, Hiroshi Amano, "In-situ x-ray characterizations of GaN and related materials", *Progress in Crystal Growth and Characterization of Materials (review journal)*, (2017).
5. Dongwei Xu, **Guangxu Ju**, Carol Thompson, Peter Zapol, and G. Brian Stephenson, "Multilayer Persistence in Island Arrangements During Layer-by-Layer Growth", *Physical Review B*, (2017).

### Published

1. **Guangxu Ju**, Masao Tabuchi, Yoshikazu Takeda, and Hiroshi Amano,"Role of Threading Dislocations in Strain Relaxation during GaInN Growth Monitored by *Real-time* X-ray Reflectivity", *Applied Physics Letters*, vol.110, 262105 (2017).
2. **Guangxu Ju**, Matthew J. Highland, Carol Thompson, Jeffrey A. Eastman, Hua Zhou, Peter M. Baldo, G.Brian Stephenson, and Paul H. Fuoss, "Development of a metal-organic vapor phase epitaxy growth system for *in situ* studies of III-nitride growth using coherent x-rays scattering probes", *Review of Scientific Instruments*, vol.88, 035113 (2017).
3. Matthew Highland, Dillon D. Fong, **Guangxu Ju**, Carol Thompson, Pete Baldo, Paul Fuoss, and Jeffrey A. Eastman, "*In-situ* X-ray Studies of Compositional Control during Synthesis of $LaGaO_3$ by RF-Magnetron Sputtering", *Applied Physics Letters*, vol.107, 081606 (2015).
4. **Guangxu Ju**, Shingo Fuchi, Masao Tabuchi, Hiroshi Amano, and Yoshikazu Takeda, "Continuous *in situ* X-ray reflectivity investigation on InGaN epitaxial growth by metalorganic vapor phase epitaxy", *Journal of Crystal Growth (Elsevier)*, Vol.407, pp. 68-73 (2014).
5. **Guangxu Ju**, Yoshio Honda, Masao Tabuchi, Yoshikazu Takeda, and Hiroshi Amano; "*In situ* X-ray investigation of changing barrier growth temperatures on InGaN single quantum wells in metal-organic vapor phase epitaxy", *Journal of Applied Physics (AIP)*, Vol. 115, pp.094906 (2014).
6. **Guangxu Ju**, Shingo Fuchi, Masao Tabuchi, Yoshikazu Takeda, and Hiroshi Amano: "X-ray investigations of GaInN single quantum wells grown by atomic layer epitaxy and metalorganic vapor phase epitaxy", *Physics Status Solidi C (IOP)*, Vol. 11, pp. 393-396 (2014).
7. **Guangxu Ju**, Shingo Fuchi, Masao Tabuchi, and Yoshikazu Takeda: "*In situ* X-ray reflectivity of indium supplied on GaN templates by Metalorganic Vapor Phase Epitaxy", *Journal of Applied Physics (AIP)*, Vol.114, pp.124906-124913 (2013).
8. **Guangxu Ju**, Shingo Fuchi, Masao Tabuchi, and Yoshikazu Takeda: "*In situ* X-ray measurements of MOVPE growth of $In_xGa_{1-x}N$ single quantum well", *Journal of Crystal Growth (Elsevier)*, Vol. 370, pp. 36-41 (2013).

9. **Guangxu Ju**, Shingo Fuchi, Masao Tabuchi, and Yoshikazu Takeda: "*In situ* X-ray Reflectivity Measurements on Annealed $In_xGa_{1-x}N$ Epilayer Grown by Metalorganic Vapor Phase Epitaxy", *Japanese Journal of Applied Physics (JSAP)*, Part 1 Vol. 52, No. 8, pp. 08JB12-1-08JB125 (2013).
10. **Guangxu Ju**, Koji Ninoi, Hajime Kamiya, Shingo Fuchi, Masao Tabuchi, and Yoshikazu Takeda: "X-ray characterization at growth temperatures of $In_xGa_{1-x}N$ growth by MOVPE", *Journal of Crystal Growth (Elsevier)*, Vol. 318, pp. 1143-1146 (2011).
11. Koji Ninoi, **Guangxu Ju**, Hajime Kamiya, Shingo Fuchi, Masao Tabuchi, and Yoshikazu Takeda: "Novel system for X-ray CTR scattering measurement on *in-situ* observation of OMVPE growth of nitride semiconductor heterostructures", *Journal of Crystal Growth (Elsevier)*, Vol. 318, pp. 1139-1142 (2011).
12. Yoshikazu Takeda, Koji Ninoi, **Guangxu Ju**, Hajime Kamiya, Tetsuya Mizuno, Shingo Fuchi, and Masao Tabuchi: "X-ray characterization of GaN and related materials at growth temperatures-system design and measurements", *IOP Conf. Ser.: Material Science and Engineering (IOP)*, Vol. 24, 012002 (2011).

## CONFERENCES

### INVITED TALK

1. **G. Ju**, S. Fuchi, M. Tabuchi, Y. Takeda, Y. Honda, M. Yamaguchi, H. Amano "Atomic Level In-Situ Monitoring During Epitaxial Growth of Group III Nitrides", The 74th JSAP Autumn Meeting, 20a-D3-5, Kyotanabe Campus, Doshisha University, Kyoto, Japan, September 16-20, 2013.
2. Hiroshi Amano, **Guangxu Ju**, Kouhei Yamashita, Tadashi Mitsunari, Yoshio Honda, Masao Tabuchi, Yoshikazu Takeda, Shingo Fuchi, "Recent development of atomic level in situ growth monitoring tools for the fabrication of nitride based light emitting devices", International Conference on White LEDs & Solid State Lighting (WLED5), A-1044, Ramada Plaza Jeju Hotel, Jeju, Korea, June 1-5, 2014.
3. H. Amano, **G. Ju**, A. Tamura, K. Yamashita, T. Mitsunari, Y. Honda, M. Tabuchi, Y. Takeda, and S. Fuchi, "Ultraprecision surface monitoring during growth of InGaN on GaN", WUPP for wide-bandgap Semiconductors (WUPP), Hilton Bath City Hotel, Bath, UK, Aug 20-22, 2014.

### CONTRIBUTED TALK

1. **Guangxu Ju**, Dongwei Xu, Matthew J. Highland, Andrew Ulvestad, Carol Thompson, Jeffrey A. Eastman, Peter Zapol, Angel Yanguas-Gil, Paul H. Fuoss, and G. Brian Stephenson, "In Situ Coherent X-ray Scattering Studies during OMVPE of GaN", 21th American Conference on Crystal Growth and Epitaxy (ACCGE-21) and 18th U.S. Workshop on Organometallic Vapor Phase Epitaxy (OMVPE-18), Santa Fe, NM, July 30 - August 4, 2017.
2. **Guangxu Ju**, M.J. Highland, Angel Yanguas-Gil, Carol Thompson, J.A. Eastman, Hua Zhou, Peter Zapol, G. Brian Stephenson and Paul H. Fuoss, "Instrument for In-Situ Coherent X-ray Studies of III-nitride MOVPE", The 18th International Conference on Metal Organic Vapor Phase Epitaxy (ICMOVPE-18),5A-1.3, San Diego, California, USA, July 10-15, 2016.
3. **Guangxu Ju**, M.J. Highland, Rebecca Sichel-Tissot, J.A. Eastman, P.M. Baldo, Peter Zapol, Carol Thompson, and P.H. Fuoss, "In-Situ X-ray Studies of AlN Nucleation on Sapphire (0001) during Reactive Sputtering", MRS fall meeting, Boston, Massachusetts, Nov 29-Dec 4, 2015.
4. **Guangxu Ju**, Matthew J. Highland, Carol Thompson, Jeffrey A. Eastman, G. Brian Stephenson, Paul H. Fuoss, "Diffractometer and Growth System for In-situ Coherent X-ray Studies of Epitaxy", 20th American Conference on Crystal Growth and Epitaxy (ACCGE-20) and 17th U.S. Workshop on Organometallic Vapor Phase Epitaxy (OMVPE-17), Big Sky, Montana, US, Aug 2-7, 2015.
5. **Guangxu Ju**, Yoshio Honda, Masao Tabuchi, Hiroshi Amano, and Yoshikazu Takeda, "In situ X-ray investigation on InGaN SQWs with various growth conditions of GaN quantum barriers by MOVPE", The 10th International Conference on Nitride Semiconductors (ICNS-10), Gaylord National Hotel and Convention Center, Washington, DC, USA, August 25-30, 2013.
6. **Guangxu Ju**, Yoshio Honda, Masao Tabuchi, Yoshikazu Takeda, Hiroshi Amano, "Continuous in situ X-ray reflectivity measurement on InGaN epitaxial growth by MOVPE", The 17th International Conference on Crystal Growth (ICCGE-17), Warsaw, Poland, August 11-16, 2013.
7. **Guangxu Ju**, Yoshio Honda, Shingo Fuchi, Masao Tabuchi, Yoshikazu Takeda, and Hiroshi Amano, "Continuous in-situ X-ray reflectance on $In_xGa_{1-x}N$ single quantum well by MOVPE", OPTICS & PHOTONICS International Congress 2013, Conference on LED and Its Industrial Application'13 (LEDIA'13), LED1-5, Yokohama, Japan, April 23-25, 2013.

8. **Guangxu Ju**, Yoshio Honda, Shingo Fuchi, Masao Tabuchi, Hiroshi Amano, and Yoshikazu Takeda, "In situ X-ray measurements of In-rich InGaN growth by MOVPE", The 60th JSAP Spring Meeting, 27p-G21-5, Kanagawa Institute of Technology, Japan, March 27-30, 2013.
9. **Guangxu Ju**, Kouta Yasunisi, Shingo Fuchi , Masao Tabuchi, Yoshikazu Takeda, "In-situ X-ray measurements of $In_xGa_{1-x}N$ single quantum well epitaxial growth by MOVPE", The 16th International Conference on Metal Organic Vapor Phase Epitaxy (ICMOVPE-16), TuB3-2, Busan, Korea, May 20-25, 2012.
10. **Guangxu Ju**, Kouta Yasunisi, Shingo Fuchi, Masao Tabuchi, Yoshikazu Takeda, "In situ X-ray measurements of MOVPE growth of $In_xGa_{1-x}N$ single quantum well", The 59th JSAP Spring Meeting, 18p-B5-5, Waseda University, Japan, March 15-18, 2012.
11. **Guangxu Ju**, Koji Ninoi, Hajime Kamiya, Shingo Fuchi, Masao Tabuchi, Yoshikazu Takeda, "$In_xGa_{1-x}N$ grown by MOVPE installed in the CTR scattering measurement system", The 71st JSAP Autumn Meeting, 15p-ZT-8, Nagasaki University, September 14-17, 2010.

**OTHERS**

1. **Guangxu Ju**, Yoshio Honda, Masao Tabuchi, Yoshikazu Takeda, and Hiroshi Amano, "In situ X-ray investigation on InGaN SQWs with various growth conditions of GaN barriers by MOVPE", 2013 JSAP-MRS Joint Symposia, 16p-PM1-17, Doshisha University, Kyoto, Japan, September 16-20, 2013.
2. **Guangxu Ju**, Shingo Fuchi, Masao Tabuchi, Yoshikazu Takeda, "In-situ X-ray reflection and CTR monitoring of InGaN/GaN heteroepitaxy by MOVPE", 12th Akasaki Research Center Symposium (ARC12th), Nagoya, Japan, February 27, 2013.
3. **Guangxu Ju**, Kota Yasunishi, Shingo Fuchi, Masao Tabuchi, and Yoshikazu Takeda, "Real-time X-ray reflectivity investigation on $In_xGa_{1-x}N$ epilayer growth by MOVPE", International Workshop on Nitride Semiconductors 2012 (IWN2012), TuP-GR-32, Sapporo, Japan, October 14-19, 2012.
4. **G. Ju**, K. Ninoi, H. Kamiya, S. Fuchi, M. Tabuchi, and Y. Takeda, "X-ray CTR scattering measurement at growth temperature of $In_xGa_{1-x}N$ grown by MOVPE", The 16th International Conference on Crystal Growth (ICCG-16), Session 15, Beijing, China, August 8-13, 2010.
5. G. Brian Stephenson, **Guangxu Ju**, Dongwei Xu, A. Ulvestad, E. Perret, Carol Thompson, M.J. Highland, Peter Zapol, and P.H. Fuoss, "In Situ Studies of GaN Vapor Phase Epitaxy on Various Surface Orientations", 14th International Conference on Surface X-ray and Neutron Scattering, Charles B. Wang Center-Stony Brook University, US, July 10-14, 2016.
6. P.H. Fuoss, **Guangxu Ju**, M.J. Highland, Hua Zhou, Carol Thompson, Dongwei Xu, Peter Zapol, Jeffrey A. Eastman, and G. Brian Stephenson "New Directions in In Situ X-Ray Studies of Vapor Phase Crystal Growth", International Workshop on Phase Retrieval and Coherent Scattering, St. Malo, France, June 7-10, 2016.
7. Dongwei Xu, Carol Thompson, Peter Zapol, **Guangxu Ju**, M.J. Highland, P.H. Fuoss, G. Brian Stephenson "Kinetic Monte Carlo Simulations of MOVPE of GaN on c-Plane and m-Plane Surfaces",The 18th International Conference on Metal Organic Vapor Phase Epitaxy (ICMOVPE-18), San Diego, California, USA, July 10-15, 2016.
8. P.H. Fuoss, **Guangxu Ju**, M.J. Highland, Hua Zhou, Angel Yanguas-Gil, Carol Thompson, Dongwei Xu, Peter Zapol, Jeffrey A. Eastman, and G. Brian Stephenson "New Directions in In Situ X-Ray Studies of Vapor Phase Crystal Growth",The 18th International Conference on Crystal Growth (ICCGE-18), Nagoya, Japan, August 7-12, 2016.
9. J.A. Eastman, M.J. Highland, D.D. Fong, Carol Thompson, **Guangxu Ju**, P.M. Baldo, H. Zhou, and P.H. Fuoss, "In-Situ X-ray Studies of the Growth of Ultrathin Epitaxial $LaGaO_3$ films with Controlled Surface Termination", MRS fall meeting, Boston, Massachusetts, Nov 29-Dec 4, 2015.
10. Brian Stephenson, Edith Perret, Matthew Highland, **Guangxu Ju**, Dongwei Xu, Stephen Streiffer, Peter Zapol, Paul Fuoss, Anneli Munkholm, and Carol Thompson, "Anisotropic Island Nucleation and Growth During Metal-Organic Vapor Phase Epitaxy of m-Plane GaN", Compound Semiconductor Week 2015, Santa Barbara, CA, June 28-July 3, 2015
11. Tadashi Mitsunari, Kouhei Yamashita, **Guangxu Ju**, Yoshio Honda, Masahito Yamaguchi, Hiroshi Amano, "Nitride-based devices on GaN substrate", The 8th International Workshop on Bulk Nitride Semiconductors (IWBNS-VIII), 4a-F-1, Kloster Seeon, Bavaria, Germany, September 30-October 05, 2013.
12. Hiroshi AMANO, Tomohiro Doi, Kohei Yamashita, **Guangxu Ju**, Yoshio Honda, Masahito Yamaguchi, "Growth of InGaN-based multiple-quantum-well structures by Increased pressure metalorganic vapor phase epitaxy and atomic layer epitaxy", The 10th International Conference on Nitride Semiconductors (ICNS-10), Gaylord National Hotel and Convention Center, Washington, DC, USA, August 25-30, 2013.

13. Masao Tabuchi, Masanori Masuda, Kota Yasunishi, **Guangxu Ju**, Hiroyuki Futaki, Yasuhiro Mori, Shingo Fuchi, and Yoshikazu Takeda, "Development of in-situ X-ray measurement system for observation of nitride-semiconductor crystal growth", The 59th JSAP Spring Meeting, 15p-F11-3, Waseda University, Japan, March 15-18, 2012.
14. Koji Ninoi, **Guangxu Ju**, Hajime Kamiya, Shingo Fuchi, Masao Tabuchi, Yoshikazu Takeda, "New X-ray CTR scattering measurement system using conventional X-ray source for in-situ observation of OMVPE growth of nitride semiconductors", The 71st JSAP Autumn Meeting, 15p-ZT-7, Nagasaki University, September 14-17, 2010.