

# Jeong Ho You

Division of Engineering and Applied Science,  
California Institute of Technology,  
1200 East California Blvd, MC 104-44,  
Pasadena CA, 91125

Tel: 626-395-3390 (office)  
217-721-4116 (cell)  
Email: jeongyou@caltech.edu  
<http://www.its.caltech.edu/~jeongyou>

---

## EDUCATION

### **UNIVERSITY OF ILLINOIS**

Urbana-Champaign, IL

**Ph.D.**, Department of Mechanical Science & Engineering, July. 2007

- Dissertation: "Effect of nanoscale defects on electrical and optical properties in III-V semiconductors"
- Advisor: Prof. Harley T. Johnson

### **UNIVERSITY OF TEXAS**

Austin, TX

**M.S.**, Department of Mechanical Engineering, Aug. 2002

- Dissertation: "Sound diffraction by jagged edge noise barriers"
- Advisors: Prof. David T. Blackstock and Dr. Penelope Menounou

### **CHUNGANG UNIVERSITY**

Seoul, Korea

**B.Eng.**, Mechanical Design & Production Engineering, Feb. 1999

## RESEARCH AREAS

- Mechanics of nanoscale systems, Atomistic scale simulations, Quantum dots, Defect analysis in nanoelectronic and optoelectronic systems, Ferroelectric materials

## WORK EXPERIENCE

Postdoctoral Scholar	California Institute of Technology, 2007 - present
Graduate Research Assistant	University of Illinois, 2002 - 2007
Teaching Assistant	University of Illinois
Graduate Research Assistant	University of Texas, 2000 - 2002

## PUBLICATIONS

- Jeong Ho You and H. T. Johnson, "**Effect of dislocations on electrical and optical properties in III-V semiconductors**," in preparation for Solid State Physics (2008). [invited, review article]
- Jeong Ho You, Jun-Qiang Lu, and H. T. Johnson, "**Electrostatic model of an edge dislocation in a complex crystalline material**," submitted to Mathematics and Mechanics of Solids (2007). [invited]
- Jeong Ho You and H. T. Johnson, "**Effects of Dislocations on Photoluminescence in GaN and GaAs**," in preparation (2007).
- Jeong Ho You and H. T. Johnson, "**Defect states in photoluminescence induced by edge dislocations in n-type GaN**," in preparation (2008).
- Jeong Ho You and H. T. Johnson, "**Effects of Threading Edge Dislocations on the Photoluminescence Spectrum in n-type Wurtzite GaN**," Phys. Rev. B, **76**, 115336 (2007).
- Jeong Ho You and H. T. Johnson, "**Effect of screw dislocation density on optical properties in n-type wurtzite GaN**," J. Appl. Phys. **101**, 023516 (2007).
- Jeong Ho You, Jun-Qiang Lu, and H. T. Johnson, "**Electron Scattering Due to Threading Edge Dislocations in n-Type Wurtzite GaN**," J. Appl. Phys. **99** 033706 (2006).

- Penelope Menounou and Jeong Ho You, “**Design of a Jagged-Edge Barrier: Numerical and Experimental study,**” Noise Control Engineering Journal **52(5)**, 210 (2004): INCE outstanding paper awarded.
- Penelope Menounou and Jeong Ho You, “**Experimental study of the diffracted sound field around jagged edge noise barriers,**” J. Acoust. Soc. Am. **116**, 2843 (2004).

## **ORAL PRESENTATIONS AND POSTERS**

- Jeong Ho You and H. T. Johnson, “**Effects of Dislocations on Photoluminescence in GaN and GaAs,**” 67<sup>th</sup> Physical Electronics Conference, Urbana, IL, June, 2007 (oral presentation).
- Jeong Ho You and H. T. Johnson, “**Effects of Dislocations on Photoluminescence in GaN and GaAs,**” 14<sup>th</sup> Semiconducting and Insulating Materials Conference (SIMC), Fayetteville, AR, May, 2007 (oral presentation).
- Jeong Ho You and H. T. Johnson, “**Computational Model for the Effects of Dislocations on Bandedge Photoluminescence Reduction and Yellow Luminescence in GaN,**” MRS Spring meeting, San Francisco, CA, April, 2007 (poster).
- Jeong Ho You and H. T. Johnson, “**Effect of Edge and Screw Dislocations on Photoluminescence in Wurtzite GaN,**” MRS Fall meeting, Boston, MA, November, 2006 (oral presentation).
- Jeong Ho You and H. T. Johnson, “**Effect of edge and open-core screw dislocations on optical properties in Wurtzite GaN,**” APS March meeting, Baltimore, MD, March, 2006 (oral presentation).
- Jeong Ho You, Jun-Qiang Lu, and H. T. Johnson, “**Electron scattering due to threading edge dislocations in n-type wurtzite GaN,**” MRS Fall meeting, Boston, MA, December, 2005 (oral presentation).
- Jeong Ho You and H. T. Johnson, “**Electron scattering due to  $[V_{Ga}-O_N]^{2-}$  threading edge dislocations in epitaxial GaN,**” MRS Fall meeting, Boston, MA, November, 2004 (poster).
- Jeong Ho You and Penelope Menounou, “**Sound diffraction by jagged edge noise barriers,**” Acoustical Society of America Conference (143rd meeting), Pittsburg, Pennsylvania, June, 2002 (oral presentation).
- Jeong Ho You, Penelope Menounou, Wayne M. Wright, “**Directivity of the diffracted field around a half plane,**” Acoustical Society of America Conference (142nd meeting), Ft. Lauderdale, Florida December, 2001 (oral presentation).

## **RESEARCH EXPERIENCE: DETAILS**

### 1. *Post-doctorate fellow*

Sep. 2007 - present

Supervised by Prof. Kaushik Bhattacharya

California Institute of Technology

#### • **Morphotropic Phase Boundary in PZT ( $PbZrTiO_3$ ) ferroelectric material**

Near Morphotropic Phase Boundary (MPB) of  $PbZr_xTi_{1-x}O_3$  ( $x \approx 52\%$ ), sudden changes of polarization, low hysteresis, and abnormal behavior of dielectric permittivity have been observed. It is speculated that these abnormal behaviors are attributed to order-disorder effect with balancing between short-range chemical interactions and long-range dipole-dipole interactions. Since it is necessary to include both short- and long-ranged potentials, uses of either atomic scale simulations or continuum calculations only will not capture the details of interesting phenomena near MPB. A new effective approach is currently under development, which can be used for a large system with millions of atoms, combining detailed microscopic knowledge of material properties with continuum treatments of materials.

## 2. *Graduate Research Assistant*

Sep. 2002 – Aug. 2007

Nano-Electro-Opto Mech. Lab. supervised by Prof. Harley T. Johnson **University of Illinois**

### • **Electron scattering due to threading edge dislocations in epitaxial wurtzite GaN**

Effects of  $V_{\text{Ga}}\text{-O}_{\text{N}}$  complex threading edge dislocations on electron mobility in a hetero-epitaxial wurtzite (WZ) GaN are computationally investigated. A high density of threading dislocations, on order of  $10^{10}\text{-}10^{11}\text{cm}^{-2}$ , is induced in epitaxially grown WZ GaN due to the large mismatches in lattice parameters and in thermal expansion coefficients with available substrates. Threading edge dislocations, which act as electron-acceptors, become negatively charged, scatter free electrons, and significantly reduce the electron mobility as well as the free carrier concentration. The charge distributions and the relaxed atomic structures along dislocations based on Density Functional Theory calculation reveal that two N atoms near Ga vacancy act as electron acceptors. An analytical solution of the filling fraction for the  $V_{\text{Ga}}\text{-O}_{\text{N}}$  complex dislocations is obtained and calculated. A closed-form solution of electron mobility due to edge dislocations is also obtained. It is found that for free carrier concentrations higher than  $10^{16}\text{cm}^{-3}$ , reducing dislocation density below  $10^8\text{cm}^{-2}$  has little beneficial effect on total mobility for typical WZ GaN samples.

### • **Effects of threading edge and screw dislocations on optical properties in GaN and GaAs.**

Computational simulation has been conducted to study the effect of edge and screw dislocations on photoluminescence intensity in WZ GaN solving the Schrödinger equation with multiband **k·p** Hamiltonian with finite element analysis in real space. Deformation potential due to inhomogeneous strain field associated with each type of dislocation, plus electrostatic potential for edge type and hexagonal material void for screw type, perturb the density of states and generate inhomogeneous band-bending for the conduction and valence bands. This inhomogeneous band-bending for each subband separates the carriers spatially resulting in the reduction of emission intensity. Reduction of band edge peak intensity with the increase of dislocation density indicates that both edge and screw dislocation act as non-radiative recombination centers. This approach also explains the different effects of dislocations on photoluminescence between GaAs and GaN.

### • **Optical properties of N ion implemented ellipsoidal GaAsN quantum dots**

The implementation of N ions into GaAs followed by thermal annealing processes generates the embedded ellipsoidal GaAsN quantum dots with the sizes of about 5nm. The optical properties of the GaAsN quantum dots are studied numerically using  $8\times 8$  **k·p** Hamiltonian. The strain field inside and outside quantum dots are calculated with Eshelby inclusion problem. The quantum mechanical confinement and deformation potential due to strain field change the characteristics of systems.

## 3. *Graduate Research Assistant*

Sep. 2000 - June 2002

Acoustics and Transducer Lab. supervised by Prof. David T. Blackstock **University of Texas**

### • **Noise reduction by jagged edge noise barriers**

Experimental and numerical investigations are conducted to study the effects of jagged top edge noise barriers. Making the straight top edge of conventional noise barriers jagged can cause a substantial degradation of the diffracted signal due to great incoherence of scattered contributions coming from the jagged edges, compared to that for the straight edge. The optimized geometry of jagged edge profiles for the stationary noise source as well as the moving sources is obtained. A significant reduction (about 70%) of the sound pressure peaks by the jagged edge barriers is achieved compared to the conventional straight edge noise barrier.

• **Directivity of the diffracted field around a half plane**

Directivity of diffracted sound field around a half plane is studied experimentally with three different top edges – straight rigid edge, jagged rigid edge and straight edge covered with sound absorptive material. Experimental data agree favorably with analytical solutions.

4. **Graduate Research Assistant**

Feb. 2000 - Aug. 2000

Laser Manufacturing Lab. supervised by Prof. Dong-sik Kim

**University of Texas**

• **Topographies of laser ablation with nano- and femto-second laser**

Numerical studies of topography of laser ablation with nanosecond and femtosecond lasers with concerning the precision of the laser manufacturing are conducted. Work also included surface planarization with grazing an incidence angle and micro-heat transfer into electrons and lattices.

**TEACHING EXPERIENCE**

*Teaching Assistant*

- Engineering Materials Laboratory
- Mechanical Design

University of Illinois

Spring, 2006

Spring, 2007

**HONORS AND AWARDS**

- INCE award for paper in NCEJ: Outstanding Paper on Cost-Effective Noise Control Treatments published in Noise Control Engineering Journal, 2007.
- Summer tuition fellowship, University of Texas-Austin, 2000
- Primary and Secondary scholarships, Chung-Ang University, 1994 and 1995.

**MEMBERSHIPS AND ACTIVITIES**

- Materials Research Society 2004 - present
- American Physical Society 2006 - present
- Acoustical Society of America 2000 - 2002
- Representative of MechSE Korean student association, Univ. of Illinois 2003 - 2004