

# Yeonsik Choi

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## POSITIONS AND EMPLOYMENT

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- 2022 - Present **Assistant Professor**  
Department of Materials Science and Engineering, Yonsei University (Seoul, S. Korea)
- Affiliated Professor**  
Department of Medical Science, Yonsei University College of Medicine (Seoul, S. Korea)
- 2018 - 2022 **NIH K99 Postdoctoral Fellow**
- Querrey Simpson Institute for Bioelectronics, Northwestern University (USA)
    - *Advisor*: Prof. John A. Rogers
    - *Project*: Bioresorbable Material-based Electronics for Cardiac Electrotherapy
  - Feinberg Cardiovascular and Renal Research Institute, Northwestern Medicine (USA)
    - *Advisor*: Prof. Rishi K. Arora (MD)
    - *Project*: Investigating Atrial Fibrillation using Novel Gene Therapy Methods
- 2011 - 2015 **Research Scientist / Application Engineer**  
TECH R&D Center, LG Chem. Ltd. (Daejeon, S. Korea)
  - Military Service Exempted Technical Research Personnel
  - *Project*: Development of Advanced Carbon Nanotube/Polymer Nanocomposite

## EDUCATION

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- 2019 **Ph.D.** **University of Cambridge** (UK), Department of Materials Science and Metallurgy
  - Cambridge Trust Scholarship
  - *Supervisor*: Prof. Sohini Kar-Narayan
  - *Thesis*: Novel Functional Polymeric Nanomaterials for Energy Harvesting Applications
- 2011 **M.S.** **Yonsei University** (Seoul, S. Korea), Department of Materials Science and Engineering
  - *Supervisor*: Prof. Cheolmin Park
  - *Thesis*: Control of Voltage Hysteresis of Carbon Nanotube Field-effect Transistors by Ferroelectric Polymer Gate Insulator
- 2009 **B.S.** **Yonsei University** (Seoul, S. Korea), Department of Materials Science and Engineering

## HONORS AND AWARDS

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- 2023 MRS Postdoctoral Award, Materials Research Society (MRS)
- 2022 Postdoc of the Month, Northwestern University
- 2021 IIN Outstanding Research Award, International Institute for Nanotechnology (IIN)
- 2021 Baxter Young Investigator Award, Baxter
- 2021 - 2022 Pathway to Independence Award (K99/R00), National Heart, Lung, and Blood Institute (NHLBI), National Institutes of Health (NIH)
- 2021 Regeneron Prize for Creative Innovation, Regeneron Pharmaceuticals, Inc.
- 2021 - 2022 BVIC Postdoctoral Fellowship, Bio-Medical Global Value Innovative Creator (BVIC) Program, Ministry of Health and Welfare of Korea

2021	2021 QSIB Opportunity Grant, Querrey Simpson Institute for Bioelectronics (QSIB)
2020	QSIB Best Project Award, Querrey Simpson Institute for Bioelectronics (QSIB)
2020	2020 QSIB Opportunity Grant, Querrey Simpson Institute for Bioelectronics (QSIB)
2019	Finalist, Schmidt Science Fellowship in Partnership with the Rhodes Trust
2019	CSAR PhD Student Award, Cambridge Society for the Application of Research (CSAR), University of Cambridge
2018	ABTA Doctoral Researcher Award, Association of British Turkish Academics (ABTA)
2018	Best Poster Award, Innovations in Large-Area Electronics Conference (innoLAE)
2017	Best Graduate Student Presentation Award, Symposium ES4: Nanogenerators and Piezotronics, Materials Research Society (MRS) Spring Meeting
2016 - 2018	NanoDTC Associate Studentship and Academic Grant, Nanoscience Doctoral Training Centre (NanoDTC), Engineering and Physical Sciences Research Council (EPSRC) Centre for Doctoral Training (CDT) in Nanoscience and Nanotechnology, University of Cambridge
2015 - 2018	Cambridge Trust Scholarship, Cambridge Commonwealth, European and International Trust, University of Cambridge
2014	Best Memorandum Award, TECH R&D Center, LG Chem. Ltd.
2014	Best Researcher Award, World Premium Material Nano Carbon Composite Center, Ministry of Knowledge Economy of Korea
2013	Best Memorandum Award, TECH R&D Center, LG Chem. Ltd.
2013	Outstanding Researcher Award, TECH R&D Center, LG Chem. Ltd.
2012	Outstanding Researcher Award, World Premium Material Nano Carbon Composite Center, Ministry of Knowledge Economy of Korea
2011	New Employee Award, LG Academy
2011	Outstanding Poster Award, Materials Research Society (MRS)
2011	Bronze Prize, Brain Korea 21 (BK21) Humantronics Information Materials Center, Ministry of Health and Welfare of Korea
2007	Excellence award, Creative Engineering Design Contest, Yonsei University
2006 - 2008	Materials Science and Engineering Department Scholarship, Yonsei University

## PUBLICATIONS

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1. Yoon, H.- J.; Lee, G.; Kim, J.- T.; Yoo, J.- Y.; Luan, H.; Cheng, S.; Kang, S.; Huynh, H. L. T.; Kim, H.; Park, J.; Kim, J.; Kwak, S. S.; Ryu, H.; Kim, J.; Choi, Y. S.; Ahn, H.- Y.; Choi, J.; Oh, S.; Jung, Y. H.; Park, M.; Bai, W.; Huang, Y.; Chamorro, L. P.; Park, Y.; Rogers, J. A. "Biodegradable, Three-dimensional Colorimetric Fliers for Environmental Monitoring," **Science Advances** 2022, 8, ade3201.
2. Yin, R.; Chen, S. W.; Lee, K. B.; Choi, Y. S.; Yang, Q.; Napolitano, M. A.; Gutruf, P.; Holleran, T. J.; Koo, J.; Haney, C. R.; Knight, H. S.; Miniovich, A. N.; Kowalik, G.; Ausra, J.; Murrio-Berlioz, A.; Rogers, J. A.; Trachiotis, G. D.; Efimov, I. R. "Open Thoracic Surgical Implantation of Cardiac Pacemakers in Rodents," **Nature Protocol** 2022, 18, 374.
3. Lee, G.\*; Ray, E.\*; Yoon, H. J.\*; Genovese, S.; Choi, Y. S.; Lee, M.- K.; Şahin, S.; Yan, Y.; Ahn, H.- Y.; 1,2, Bandodkar, A. J.; Kim, J.; Park, M.; Ryu, H.; Kwak, S. S.; Jung, Y. H.; Odabas, A.; Khandpur, U.; Ray, W. Z.; MacEwan, M. R.; Rogers, J. A. "A Bioresorbable Peripheral Nerve stimulator for Electronic Pain Block," **Science Advances** 2022, 8, eabp9169.
4. Huang, I.; Zhang, Y.; Arafa, H. M.; Li, S.; Vazquez-Guardado, A.; Ouyang, W.; Liu, F.; Madhvapathy, S.; Song, S. W.; Tzavelis, A.; Trueb, J.; Choi, Y. S.; Jeang, W. J.; Forsberg, V.; Higbee-Dempsey, E.; Ghoreishi-Haack, N.; Stepien, I.; Bailey, K.; Han, S.; Zhang, Z. J.; Good, C.; Huang, Y.; Bandodkar, A. J.; Rogers, J. A. "High Performance Dual-Electrolyte Magnesium–Iodine Batteries that Can Harmlessly Resorb in the Environment or in the Body," **Energy & Environmental Science** 2022, 10, 4095.
5. Yin, R.\*; Choi, Y. S.\*; Aras, K. K.\*; Knight, H. S.; Miniovich, A. N.; Efimov, I. R. "Innovation in Cardiovascular Bioelectronics," **Advances in Cardiovascular Technology: New Devices and Concepts**. Eds. J. Karimov; K. Fukamachi; M. Gillinov. Elsevier Academic Press 2022.
6. Choi, Y. S.\*; Jeong, H. Y.\*; Yin, R. T.\*; Avila, R.; Pfenniger, A.; Yoo, J.; Lee, J. Y.; Tzavelis, A.; Lee, Y. J.; Chen, S. W.; Knight, H. S.; Kim, S.; Ahn, H. -Y.; Wickerson, G.; Dempsey, E.; Lee, G.; Vazquez-Guardado, A.; Higbee-Dempsey, E.; Russo, B. A.; Napolitano, M. A.; Holleran, T. J.; Razzak, L. A.;

- Miniovich, A. N.; Lee, G.; Geist, B.; Kim, B.; Han, S.; Brennan, J. A.; Aras, K.; Kwak, S.; Kim, J.; Waters, E. A.; Yang, X.; Burrell, A.; Chun, K. S.; Liu, C.; Wu, C.; Rwei, A. Y.; Spann, A. N.; Banks, A.; Johnson, D.; Zhang, Z. J.; Haney, C. R.; Jin, S. H.; Rwei, A.; Sahakian, A. V.; Huang, Y.; Trachiotis, G.; Knight, B. P.; Arora, R. K.; Efimov, I. R.; Rogers, J. A. "A Transient, Closed-loop Network of Wireless, Body-integrated Devices for Autonomous Electrotherapy," **Science** 2022, 376, 1006.
7. Wang, H.; Andrea, D. D.; Choi, Y. S.; Bouricha, Y.; Wickerson, G.; Ahn, H.; Guo, H.; Huang, Y.; Jordan, S. W.; Rogers, J. A.; Franz, C. K. "Implantation and Control of Wireless, Battery-free Systems for Peripheral Nerve Interfacing," **Journal of Visualized Experiments** 2021, 176, e63085.
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  35. Lee, W.-K.\*; Choi, Y. S.\*; Kang, Y.-G.; Sung, J.; Seo, D.-S.; Park, C. "Super-fast Switching of Twisted Nematic Liquid Crystals on 2D Single Wall Carbon Nanotube Networks," *Advanced Functional Materials* 2011, 21, 3843. [Front Cover]
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## PATENTS & PATENT APPLICATIONS

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1. Choi, Y. S.; Rogers, J. A.; Efimov, I. R.; Jeong, H. Y.; Yin, R. "Transient closed-loop systems and application of same" 2022, **U.S. Patent Appl.** (No. 63,320,790).
2. Choi, Y. S.; Rogers, J. A.; Efimov, I. R.; Yin, R. "Bioresorbable cardiovascular instruments, and operation and fabrication methods of same" 2021, **U.S. Patent Appl.** (No. 63,215,070).
3. Kar-Narayan, S.; Choi, Y. S. "Trielectrostatic generator, method for manufacture thereof and elements thereof" 2020, **U.S. Patent Appl.** (No. 16,634,081) (International Patent Appl. No. PCT/EP2017/068810).
4. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Composite with improved mechanical properties and molded article including the same" 2020, **U.S. Patent** (No. 10,626,252) (International Patent Appl. No. PCT/KR2015/009137).
5. Choi, Y. S.; Lee, S. M.; Yun, C. H.; Choi, G. D. "Thermoplastic polymer combined with carbon nanomaterial and method of preparing the same" 2019, **U.S. Patent** (No. 10,266,675) (International Patent Appl. No. PCT/KR2014/008016).
6. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Methods for combining thermoplastic polymer with carbon nanomaterial" 2019, **U.S. Patent Appl.** (No. 16,724,652).
7. Yun, C. H.; Lee, S. M.; Choi, G. D.; Choi, Y. S. "Radar cover-use resin composition, and radar cover and radar apparatus obtained therefrom" 2018, **U.S. Patent** (No. 10,017,631) (International Patent Appl. No. PCT/KR2015/014366).
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9. Choi, Y. S.; Lee, S. M.; Yun, C. H.; Choi, G. D. "Carbon nanomaterial-containing resin composition and molded plastic product" 2018, **U.S. Patent** (No. 9,932,494) (Japan Patent No. 5,989,914).
10. Choi, Y. S.; Kar-Narayan, S. "Trielectrostatic generation" 2018, **International Patent Appl.** (No. PCT/GB2018/053331).
11. Choi, Y. S.; Lee, S. M.; Yun, C. H.; Choi, G. D. "Resin composition containing carbon nanomaterial and plastic molded product" 2014, **European Patent** (No. 2,881,428) (International Patent Appl. No. PCT/KR2014/008020.)
12. Lee, S. M.; Choi, Y. S.; Choi, G. D.; Yun, C. H. "Thermoplastic resin composition for radar cover" 2017, **U.S. Patent** (No. 9,840,609) (Japan Patent No. 5,941,231; Korean Patent No. 101,629,790; China Patent No. 104,837,926; International Patent Appl. No. PCT/KR2014/011963).
13. Kar-Narayan, S.; Choi, Y. S. "Trielectrostatic generator, method for manufacture thereof and elements thereof" 2017, **International Patent Appl.** (No. PCT/EP2017/072742).
14. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Composite material with improved mechanical properties and molded article containing same" 2014, **U.S. Patent Appl.** (No. 2014762347) (International Patent Appl. No. PCT/KR2014/011806).
15. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Composite material having improved electrical conductivity and molded part containing same" 2014, **European Patent** (No. 3,078,708). (U.S. Patent Appl. No. 2014913626; International Patent Appl. No. PCT/KR2014/001007).
16. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Composite material having improved electrical conductivity and molded article containing same" 2014, **U.S. Patent Appl.** (No. 2014760938) (International Patent Appl. No. PCT/KR2014/011814).
17. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Composite having improved electrical conductivity and mechanical property" 2014, **Korean Patent Appl.** (No. 10-2014-0113751).
18. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Mechanically reinforced composite and plastic goods" 2014, **Korean Patent Appl.** (No. 10-2014-0113752).
19. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. "Processing method for resin composite and plastic goods

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20. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. “Thermoplastic resin composition of multifunctional composite” 2014, **Korean Patent Appl.** (No. 10-2014-0113753).
  21. Lee, S. M.; Choi, Y. S.; Choi, G. D.; Yun, C. H. “Processing condition of multi-screw extruder for high performance thermoplastic composite” 2014, **Korean Patent Appl.** (No. 10-2014-0190166).
  22. Park, C. M.; Sung, J. W.; Choi, Y. S.; Cho, S. H. “Field-induced polymer electroluminescence device containing single wall carbon nanotubes and the manufacturing method thereof” 2013, **Korean Patent** (No. 1,299,337).
  23. Choi, S. T.; Kwon, J. O.; Park, Y. J.; Park, C. M.; Choi, Y. S. “Electroactive polymer actuator and method of manufacturing the same” 2013, **U.S. Patent** (No. 8,564,181) (European Patent No. 2,463,926; Japanese Patent No. 2012-125140; China Patent No. 102,593,345).
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  25. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. “Treatment method of carbon-nanomaterial and carbon-nanomaterial obtained from the method” 2013, **Korean Patent Appl.** (No. 10-2013-0104594).
  26. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. “Thermoplastic polymer bonded with carbon-nanomaterial and method for preparing the same” 2013, **Korean Patent Appl.** (No. 10-2013-0104906).
  27. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. “Resin composition comprising carbon-nanomaterial, and plastic molded product” 2013, **Korean Patent Appl.** (No. 10-2013-0104595).
  28. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. “Composite having improved conductivity and plastic comprising same” 2013, **Korean Patent Appl.** (No. 10-2013-0151475).
  29. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. “Composite having improved mechanical property and plastics comprising same” 2013, **Korean Patent Appl.** (No. 10-2013-0151488).
  30. Choi, Y. S.; Lee, S. M.; Choi, G. D.; Yun, C. H. “Thermoplastic which contains carbon nanotube hybrid” 2013, **Korean Patent Appl.** (No. 10-2013-0151482).
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## LECTURES

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|----------------|---|
| 2023 - Present | <b>Thermodynamics of Materials I</b> (MST2230)<br>Department of Materials Science and Engineering, Yonsei University                                    |
| 2023           | <b>Biomedical Engineering for Precision Medicine</b> (MES7625) - Guest Lecturer<br>Department of Medical Science, Yonsei University College of Medicine |
| 2022 - Present | <b>Thermodynamics of Materials II</b> (MST2240)<br>Department of Materials Science and Engineering, Yonsei University                                   |
| 2019           | <b>Bioelectronics</b> (BME 353) - Guest Lecturer<br>Department of Biomedical Engineering, Northwestern University                                       |
| 2010           | <b>Materials Design and Evaluation</b> (MST2320) - Teaching Assistant<br>Department of Materials Science and Engineering, Yonsei University             |

## INVITED TALK & CONFERENCE PRESENTATION

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1. (Invited) “A Transient Closed-Loop System for Temporary Electrotherapy,” **7<sup>th</sup> IEEE Electron Devices Technology and Manufacturing (EDTM) Conference 2023**, Seoul, S. Korea, Mar 2023.
2. (Invited) “Polymer Nanocomposite with Ideal Dispersion of Nanomaterials,” **Samsung Display**, Yongin, S. Korea, Feb 2023.

3. (Invited) "Soft Materials for Bioresorbable Medical Devices," **9th Convergence Medical Technology Center Symposium by Yonsei University College of Medicine**, Seoul, S. Korea, Jan 2023.
4. (Invited) "Soft Materials for Bioresorbable Medical Devices," **Yonsei University College of Dentistry**, Seoul, S. Korea, Dec 2022.
5. (Invited) "Soft Materials for Bioresorbable Medical Devices," **Gwangju Institute of Science and Technology (GIST)**, Gwangju, S. Korea, Nov 2022.
6. (Poster) "A Bioresorbable Pacemaker with Transient Closed-loop Systems," **American Heart Association (AHA) Scientific Session**, Chicago, USA, Nov 2022.
7. (Invited) "Soft Materials for Bioresorbable Medical Devices," **2022 Fall Meeting of the Korean BioChip Society (KBCS)**, Jeju, S. Korea, Nov 2022.
8. (Invited) "Soft Materials for Bioresorbable Medical Devices," **2022 Fall Meeting of the Korean Ceramic Society (KCerS)**, Seoul, S. Korea, Oct 2022.
9. (Invited) "Bioresorbable Electronic Medicine," **Gangnam Severance Hospital**, Seoul, Oct 2022.
10. (Invited) "Next-generation Medical Systems: A Bioresorbable Electronic Device," **Korea Institute of Science and Technology (KIST)**, Seoul, S. Korea, Aug 2022.
11. (Invited) "Next-generation Medical Systems: A Bioresorbable Pacemaker," **Biological Research Information Center (BRIC)**, Virtual, Aug 2022.
12. (Oral) "A Closed-Loop Network of Wireless, Body-Integrated Devices for Temporary Electrotherapy," **2022 Materials Research Society (MRS) Spring Meeting**, Hawaii, USA, May 2022.
13. (Invited) "Bioresorbable Cardiac Pacemakers," **BioXTech**, Virtual, April 2022.
14. (Invited) "Novel Concepts in Pacing II: Dissolving PMs," **American College of Cardiology's Annual Scientific Session (ACC.22)**, Washington DC, USA, Apr 2022. (on behalf of Prof. John A. Rogers)
15. (Invited) "Bioresorbable Cardiac Pacemakers," **International Congress on Advanced Cardiology and Cardiovascular Research (Adv. Cardiology 2022)**, Paris, France, Mar 2022.
16. (Invited) "Soft Materials for Transient Electronics," Department of Materials Science and Engineering, **University of Illinois at Urbana-Champaign (UIUC)**, Urbana, USA, Mar 2022.
17. (Invited) "A Transient Closed-loop System for Autonomous Electrotherapy," Mechanical Engineering Department, **Columbia University**, Virtual, Feb 2022.
18. (Invited) "Soft Materials for Transient Electronics," Department of Chemistry, **University of Illinois at Urbana-Champaign (UIUC)**, Urbana, USA, Jan 2022.
19. (Oral) "Fully Bioresorbable, Leadless, Battery-Free Cardiac Pacemaker," **2021 Materials Research Society (MRS) Fall Meeting**, Boston, USA, Dec 2021.
20. (Invited) "Transient Electronics for Biomedical Applications," **Precision Biology Research Center (PBRC)**, Seoul, S. Korea, May 2021.
21. (Invited) "Bioresorbable Electronic Implants for Neuromuscular Regeneration," **Biological Research Information Center (BRIC)**, Virtual, May 2021.
22. (Invited) "Transient Electronics for Sustainable Packaging Platform," Institute of Materials Science and Engineering, **École polytechnique fédérale de Lausanne (EPFL)**, Virtual, October 2020.
23. (Invited) "Transient Electronics for Cardiac Electrotherapy," Institute of Biomedical Engineering, **University of Toronto**, Virtual, July 2020.
24. (Oral) "Fully Bioresorbable, Wireless, Battery-free Cardiac Pacemaker for Neonatal and Pediatric Patients," **Biomedical Engineering Society (BMES)**, Virtual, October 2020.
25. (Oral) "Printed Polymer Nanocomposites with High Uniformity for Triboelectric Nanogenerators," **International Conference on Nanogenerators and Piezotronics (NGPT)**, Seoul, S. Korea, May 2018.
26. (Oral) "Highly-Uniform and Well-Dispersed Polymer Nanocomposites for Energy Harvesting Application," **2018 Materials Research Society (MRS) Spring Meeting**, Phoenix, USA, Apr 2018.
27. (Poster) "Advanced Printing Technique for Polymer Nanocomposites," **Innovations in Large-Area Electronics Conference (innoLAE 2018)**, Cambridge, UK, Jan 2018.
28. (Poster) "Nanogenerators for Energy Harvesting" **Nanoshowcase 2017**, Cambridge, UK, Nov 2017.

29. (Poster) "Self-poled Nylon-11 Nanowires for Triboelectric Energy Harvesting Devices," **Armourers and Brasiers' Cambridge Forum**, Cambridge, UK, Jun 2017.
30. (Poster) "Nano-confined Ferroelectric Polymer Nanowires for Triboelectric Nanogenerators," **Ministry of Defence Poster Session**, Cambridge, UK, May 2017.
31. (Oral) "Nanoconfined  $\gamma$ -Phase Ferroelectric Nylon Nanowire for Energy Harvesting Devices," **2017 Materials Research Society (MRS) Spring Meeting**, Phoenix, USA, Apr 2017.
32. (Oral) "Device using Static Electricity," **Maxwell Centre Annual Research Showcase**, Cambridge, UK, Mar 2017.
33. (Poster) "Design Rules for the Multi-layered and Multi-grated Free-standing Triboelectric Nanogenerator," **Innovations in Large-Area Electronics Conference (innoLAE 2017)**, Cambridge, UK, Feb 2017.
34. (Oral) "Nano-confined Ferroelectric Polymer Nanowires for Triboelectric Nanogenerators," **International Conference on Nanogenerators and Piezotronics**, Rome, Italy, Jun 2016.
35. (Poster) "Hysteresis-free Operation of Carbon Nanotube Based Ferroelectric Field-effect transistor," **2011 Materials Research Society (MRS) Spring Meeting**, San Francisco, USA, Apr 2011.
36. (Poster) "Thin SWNTs/Conjugate Block Copolymer Nanocomposites for High Performance Liquid Crystal Alignment and Switching," **The Polymer Society of Korea Spring Meeting**, Daejeon, S. Korea, Apr 2011.
37. (Poster) "Hysteresis-free Carbon Nanotube Network Transistors Embedded in Conjugated Block Copolymers," **The Polymer Society of Korea Fall Meeting**, Daejeon, S. Korea, Oct 2010.
38. (Poster) "The Influence of P(VDF-TrFE) Crystal Structure for Liquid Crystal Alignment Layer," **Japan Society for the Promotion of Science**, Tokyo, Japan, Jun 2010.
39. (Poster) "Solution-processable TIPS-Pentacene/PS Blend Microcrystal Array for High Performance Organic Thin Film Transistor," **The Polymer Society of Korea Spring Meeting**, Daejeon, S. Korea, Apr 2010.