

Hongki Kang, Ph.D.

BK21 Postdoctoral researcher
in Department of Bio and Brain Engineering at KAIST

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CONTACT INFORMATION

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EMPLOYMENT HISTORY

- 2015 – Now **BK21 Postdoctoral researcher, Dept. of Bio and Brain Engineering**
KAIST, Daejeon, South Korea
PI: Dr. Yoonkey, Nam
- 2014 – 2015 **Postdoctoral Research Scientist, Dept. of Electrical Engineering**
Columbia University, New York, NY United States
PI: Dr. Kenneth L. Shepard
- 2012 **Technical Co-op,**
IBM Semiconductor Research and Development Center, East Fishkill, NY United States
Manager: Dr. Dan M. Mocuta, Dr. Dae-Gyu Park, and Dr. Chris M. Schnabel

EDUCATION

- 2008 – 2013 **Ph.D., Electrical Engineering and Computer Sciences,**
University of California, Berkeley, Berkeley, CA, United States
Research advisor: Dr. Vivek Subramanian
Dissertation: Gravure-printed Highly-scaled Organic Thin-film Transistors for Low-cost and Large-area Electronics
- 2008 – 2010 **M.S., Electrical Engineering and Computer Sciences,**
University of California, Berkeley, Berkeley, CA, United States
Research advisor: Dr. Vivek Subramanian
Thesis: Hydrostatic optimization of inkjet-printed films
- 2004 – 2008 **B.S., Electrical Engineering,**
KAIST, Daejeon, South Korea
Summa Cum Laude
Research advisor: Dr. Yang-Kyu Choi
Thesis: Analytical Threshold Voltage Model for Double-Gate MOSFETs with Localized Charges

RESEARCH INTERESTS

- Bioelectronics, and neural engineering/interface
- Flexible neural probes for chronic, large-scale neural stimulation and record
- Solution processed low-cost and large area flexible electronics
- Roll-to-roll/inkjet printing technologies research and development
- Impact of hydrostatic/dynamics and wetting phenomena on printed and solution-processed devices
- Low frequency noise behavior of novel semiconductor devices for sensor/RF applications

HONORS AND AWARDS

- 2004 – 2008 Scholarship of the 2nd Presidential Science Scholarship from Korea Science and Engineering Foundation, certified by South Korean President Roh, Moo-hyun
2003 Gold Prize at 15th National Math/Science Olympiad, Physics Part
2002 Scholarship of Samsung, JFL (Junior Frontier Leader)

RESEARCH EXPERIENCES

- Jul. 2014 – **Neural Engineering Laboratory, KAIST, Daejeon, South Korea**
Now PI: Prof. Yoonkey, Nam
BK21 Postdoctoral researcher
- Mar. 2014 – **Bioelectronic Systems Lab, Columbia University, New York, NY United States**
Jun. 2015 PI: Prof. Kenneth L. Shepard
Postdoctoral research scientist
- Novel IC design/fabrication for flexible neural/biomedical/implantable electronics applications
 - Flexible CMOS probes for chronic, large-scale neural stimulation and record
 - Micron-scale ultrasonic sensing tags
 - Vertical GaN power transistors and boost converters, ARPA-E SWITCHES program, “Vertical GaN Power Transistors Using Controlled Spalling for Substrate Heterogeneity”
- Oct. 2008 – **Printed Electronics group, UC Berkeley, Berkeley, CA United States**
Dec. 2013 PI: Prof. Vivek Subramanian
Graduate student researcher
- Gravure-printed highly-scaled features and thin-film transistors
 - Understanding of low frequency noise (1/f noise) in organic TFTs
 - Fundamental understanding of the pattern generation of printed films
 - Electrowetting devices
- Jun. 2012 – **IBM Semiconductor Research and Development Center, East Fishkill, NY United States**
Aug. 2012 *Summer Co-Op* in 14nm CMOS Device Design area
(supervised by Dr. Dan M. Mocuta, Dr. Dae-Gyu Park, and Dr. Chris M. Schnabel)
- Sep. 2007 – **Integrated Organic Electronics Lab, KAIST, Daejeon, South Korea**
May 2008 PI: Prof. Seunghyup Yoo
Undergraduate researcher
- Fabrication of organic conductors by using Micro Contact Printing (μ CP)
- Mar. 2007 – **Nano Bio Electronics Laboratory, KAIST, Daejeon, South Korea**
Dec. 2007 PI: Prof. Yang-Kyu Choi
Undergraduate researcher
- Hot-Carrier-Effects in Double Gate MOSFETs

PUBLICATIONS

Printed, Solution Processed, and Flexible Thin-film Transistors

- 2015
1. Rungrot Kitsomboonloha, [Hongki Kang](#), Gerd Grau, William Scheideler, and Vivek Subramanian, “Misalignment-tolerant high-resolution gravure printed top-gate organic thin film transistors on plastic: breaking the 1MHz barrier,” ADVANCED ELECTRONIC MATERIALS, 2015. (SUBMITTED)
 2. Jaewon Jang, [Hongki Kang](#), Himamshu C. Nallan Chakravarthula, and Vivek Subramanian, “Fully inkjet-printed transparent oxide thin film transistors using a fugitive wettability switch,” ADVANCED ELECTRONIC MATERIALS, 2015. (Link)

- 2015 3. Vivek Subramanian, Jialiang Cen, Alejandro de la Fuente Vornbrock, Gerd Grau, Hongki Kang, Rungrot Kitsomboonloha, Daniel Soltman, and Huai-Yuan Tseng, "High-speed printing of transistors: From Inks to Devices," PROCEEDINGS of the IEEE, vol. 103, no. 4, 2015. (Link)
4. Gerd Grau, Rungrot Kitsomboonloha, Hongki Kang, and Vivek Subramanian, "High performance printed organic transistors using a novel scanned thermal annealing technology," ORGANIC ELECTRONICS, vol. 20, pp. 150–157, May 2015. (Link)
- 2014 5. Hongki Kang, Rungrot Kitsomboonloha, Kurt Ulmer, Lisa Stecker, Gerd Grau, Jaewon Jang and Vivek Subramanian, "Megahertz-class printed high mobility organic thin-film transistors and inverters on plastic using attoliter-scale high-speed gravure-printed sub-5 μm gate electrodes," ORGANIC ELECTRONICS, vol. 15, no. 12, pp. 3639–3647, Dec. 2014. (Link)
6. Hyuk-Jun Kwon, Jaewon Jang, Hongki Kang, Sunkook Kim, Vivek Subramanian and Costas P. Grigoropoulos, "Electrical Characteristics of Multilayer MoS₂ Transistors at Real Operating Temperatures and Different Ambient Conditions," ECS Trans. 2014, volume 64, issue 8, 127-133, 2014. (Link)
7. Gerd Grau, Rungrot Kitsomboonloha, Sarah L Swisher, Hongki Kang, Vivek Subramanian, "Printed Transistors on Paper: Towards Smart Consumer Product Packaging," ADVANCED FUNCTIONAL MATERIALS, vol. 24, no. 32, pp. 5067–5074, 2014. (Link)
- 2012 8. Hongki Kang, Rungrot Kitsomboonloha, Jaewon Jang, and Vivek Subramanian, "High-performance printed transistors realized using femtoliter gravure-printed Sub-10 μm metallic nanoparticle patterns and highly uniform polymer dielectric and semiconductor layers," ADVANCED MATERIALS, vol. 24, no. 22, pp. 3065–3069, 2012. (Link)
9. Jaewon Jang, Rungrot Kitsomboonloha, Sarah L. Swisher, Eung Seok Park, Hongki Kang, and Vivek Subramanian, "Transparent High-Performance Thin Film Transistors from Solution-Processed SnO₂/ZrO₂ Gel-like Precursors," ADVANCED MATERIALS, vol. 25, no. 7, pp. 1042–1047, 2012. (Link)
- 2010 10. Alejandro de la Fuente Vornbrock, Donovan Sung, Hongki Kang, Rungrot Kitsomboonloha, and Vivek Subramanian, "Fully gravure and ink-jet printed high speed pBTTT organic thin film transistors," ORGANIC ELECTRONICS, vol. 11, no. 12, pp. 2037-2044, DEC 2010. (Link)

1/f Noise Study

- 2014 11. Hyuk-Jun Kwon, Hongki Kang, Jaewon Jang, Sunkook Kim, and Costas P. Grigoropoulos, "Flicker noise analysis of 2D multi-layer MoS₂ transistors," APPLIED PHYSICS LETTERS, 104, 083110, 2014. (Link) – Equal contribution with H.-J. Kwon
12. Hongki Kang, and Vivek Subramanian, "Measurement and analysis of 1/f noise under switched bias in organic thin film transistors," APPLIED PHYSICS LETTERS, 104, 023301, 2014. (Link)
- 2011 13. Hongki Kang, Lakshmi Jagannathan, and Vivek Subramanian, "Measurement, analysis, and modeling of 1/f noise in pentacene TFTs," APPLIED PHYSICS LETTERS, 99, 062106, 2011. (Link)

Fluid Mechanics Study in Printing

- 2010 14. Dan Soltman, Ben Smith, Hongki Kang, S.J.S. Morris, and Vivek Subramanian, "Methodology for inkjet printing partially wetting films," LANGMUIR, 2010, 26 (19), pp 15686-15693. (Link)
15. Hongki Kang, Dan Soltman, and Vivek Subramanian, "Hydrostatic Optimization of Inkjet-Printed Films," LANGMUIR, 2010, 26(13), 11568-11573. (Link)

Multi-gate MOSFETs

- 2008 16. Hongki Kang, Jin-Woo Han, and Yang-Kyu Choi, "Analytical Threshold Voltage Model for Double-Gate MOSFETs with Localized Charges," IEEE ELECTRON DEVICE LETTERS, VOL. 29, NO. 8, 927-930, AUGUST 2008. (Link)

CONFERENCES

- 2015 1. Hongki Kang, Kevin Tien, Kenneth L. Shepard, Devendra Sadana, Stephen W. Bedell, Yuhao Zhang, Min Sun, Tomás Palacios, Ajit Paranjpe, "Vertical GaN Power Transistors Using Controlled Spalling for Substrate Heterogeneity," ARPA-E Energy Innovation Summit 2015, Washington D.C., Feb 2015.
- 2013 2. Rungrot Kitsomboonloha, Hongki Kang, and Vivek Subramanian, "High Performance Organic TFTs Using High-Resolution Gravure Printed Electrodes," Materials Research Society, Boston, US, Fall 2013.
3. Gerd Grau, Rungrot Kitsomboonloha, Sarah Swisher, Hongki Kang, and Vivek Subramanian, "Printed Transistors on Paper: Towards Smart Consumer Product Packaging," LOPE-C, Germany, June 2013.
- 2012 4. (Invited) Vivek Subramanian, Stephen J. S. Morris, Hongki Kang, and Rungrot Kitsomboonloha, "Modeling, Scaling, and Integration of Gravure Printing for Fast Switching Organic FETs," Materials Research Society, Boston, US, Fall 2012.
5. Jaewon Jang, Eung Seok Park, Hongki Kang, and Vivek Subramanian, "Inkjetted Inorganic Transistors Using a Sol-gel Processed SnO₂ Semiconductor and Sb-doped SnO₂ Electrodes," Materials Research Society, Boston, US, Fall 2012.
6. Hongki Kang, Alejandro de la Fuente Vornbrock, Rungrot Kitsomboonloha, Jaewon Jang, and Vivek Subramanian, "Highly-Scaled Gravure Printed organic TFTs with 10 μm channel length on Plastic with 300 kHz operation," Materials Research Society Spring 2012.
7. (Invited) Hongki Kang, Huai-Yuan Tseng, Rungrot Kitsomboonloha, and Vivek Subramanian, "High-performance printed organic transistors: Advances in printing techniques and processes," 2012 Flexible Electronics & Displays Conference & Exhibition, Phoenix, AZ, Feb 6-9, 2012.
- 2011 8. Hongki Kang, Lakshmi Jagannathan, and Vivek Subramanian, "Measurement, analysis, and modeling of 1/f noise in pentacene TFTs," LOPE-C, Messe Frankfurt, Germany, June 2011.
- 2010 9. Jaewon Jang, Rungrot Kitsomboonloha, Lakshmi Jagannathan, Hongki Kang and Vivek Subramanian, "Electrical Characterization of close-packed ZnSe Nanoparticle Films," Materials Research Society, Boston, US, Fall 2010.
10. Dan Soltman, Ben Smith, Hongki Kang, Stephen Morris, and Vivek Subramanian, "Methodology for Inkjet Printing Partially Wetting Films," IS&T Digital Fabrication conference, Austin, TX, Sept. 19-23, 2010.
11. Dan Soltman, Ben Smith, Hongki Kang, Stephen Morris, and Vivek Subramanian, "Methodology for two dimensional pattern generation in inkjet printing," LOPE-C, Messe Frankfurt, Germany, May 2010.
12. Hongki Kang, Dan Soltman, and Vivek Subramanian, "Hydrostatic concerns in inkjet-printed films," Materials Research Society, San Francisco, US, Spring 2010.
13. Dan Soltman, Hongki Kang, and Vivek Subramanian, "Considerations for pattern generation in inkjet-printed electronics," SPIE Advanced Lithography, San Jose, US, Feb 2010.

ENGINEERING SKILLS

- Printed Electronics fabrication; Inkjet printing, Gravure printing, Micro-contact printing.
- Micro/nanofabrication on both wafer level and for post-IC process
- Bias temperature instability test, and vertical gate resistance measurement, S-parameter measurement & analysis
- Noise signal measurement & characterization in electronic devices
- Device characterization, electrical and mechanical; Silicon based transistors, and printed TFTs.
- Dynamic contact angle characterization
- Ultrasound imaging and wireless power transfer
- Piezoelectric transducer modeling
- Simulation and Design Tools: Sentaurus, Silvaco, Cadence, L-Edit, AutoCAD

TEACHING EXPERIENCES

Graduate Student Instructor, UC Berkeley, Berkeley, CA United States

- 2012 EE231, Solid State Devices (Spring 2012), Overall teaching effectiveness: N/A
- 2011 EE42/100, Introduction to Digital Electronics (Fall 2011), Overall teaching effectiveness: 5.0/5.0
- 2009 EE42/100, Introduction to Digital Electronics (Fall 2009), Overall teaching effectiveness: 4.3/5.0
EE40, Introduction to Microelectronic Circuits (Summer 2009), Overall teaching effectiveness: N/A

JOURNAL REVIEW ACTIVITIES

- IEEE Electron Device Letters
- Organic Electronics
- Langmuir
- ACS Applied Materials & Interfaces
- Journal of Electrical and Computer Engineering
- Robotics and Computer-Integrated Manufacturing

OTHER ACTIVITIES

- 2014 Columbia University IDP (Individual Development Plan) completion
- 2011 – 2012 Director of Industrial Relationship at KGSA (Korean Graduate Student Association) at UC Berkeley
- 2006 – 2008 A chair of EENL (a newsletter of the Department of Electrical Engineering at KAIST)
- 2004 – 2008 Acoustic guitar club at KAIST, 'Sixline' (performed more than 15 big and small concerts)
- 2002 A certificate achievement of 12th International Physics Olympiad Summer School, Korea Division