

April 06, 2010

Piezoelectric Nanomaterial-Based Transparent Flexible power Generators: Harvesting Waste Energy

The 7th Korea-US Nano Workshop

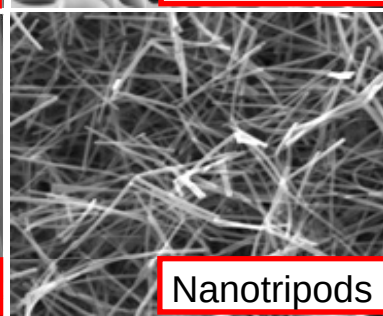
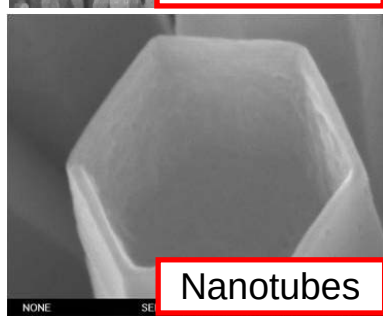
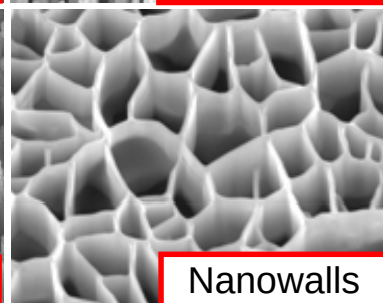
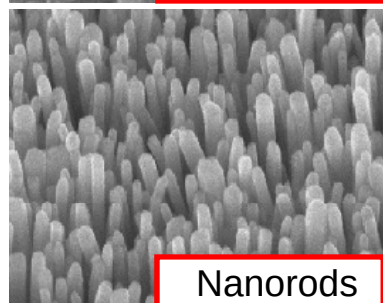
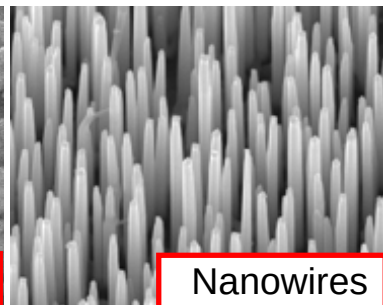
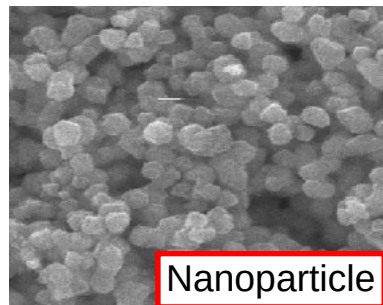
Sang-Woo Kim

School of Advanced Materials Science & Engineering,
Center for Human Interface Nanotechnology (HINT),
SKKU Advanced Institute of Nanotechnology (SAINT),
Sungkyunkwan University

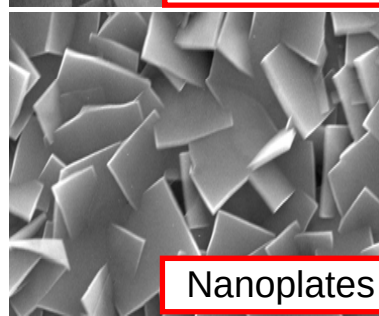
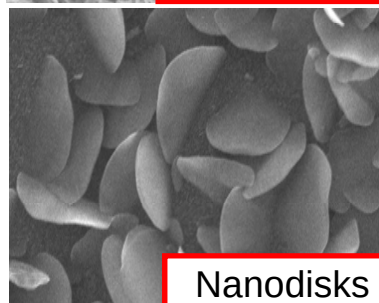
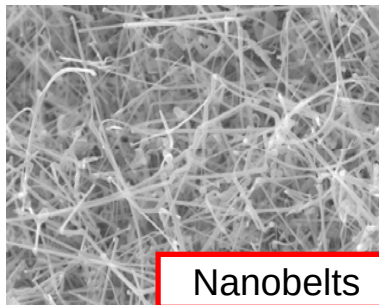


Nano Works in NESEL for Energy Harvesting & Saving

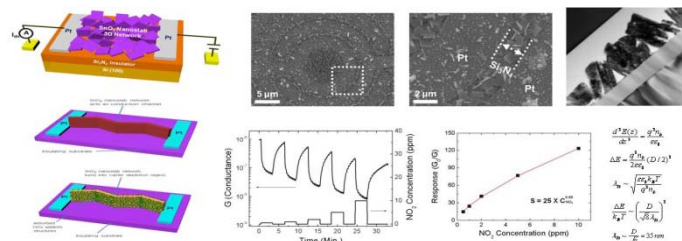
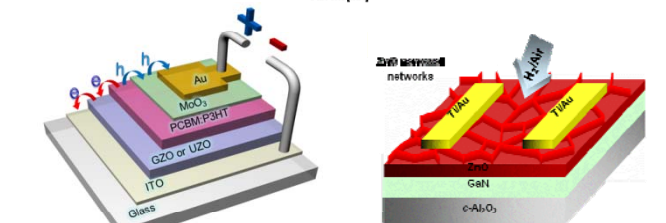
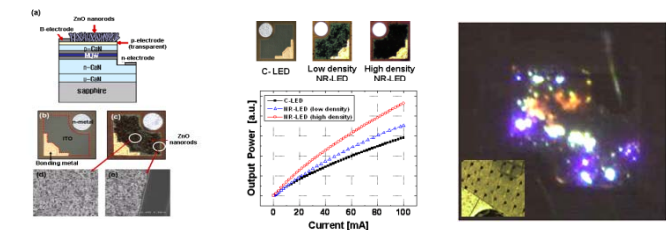
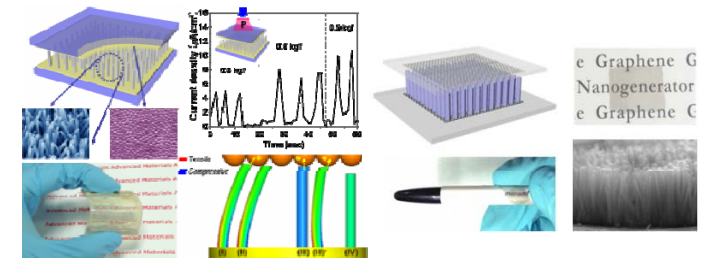
ZnO Nanostructures



Tin-Oxide Nanostructures

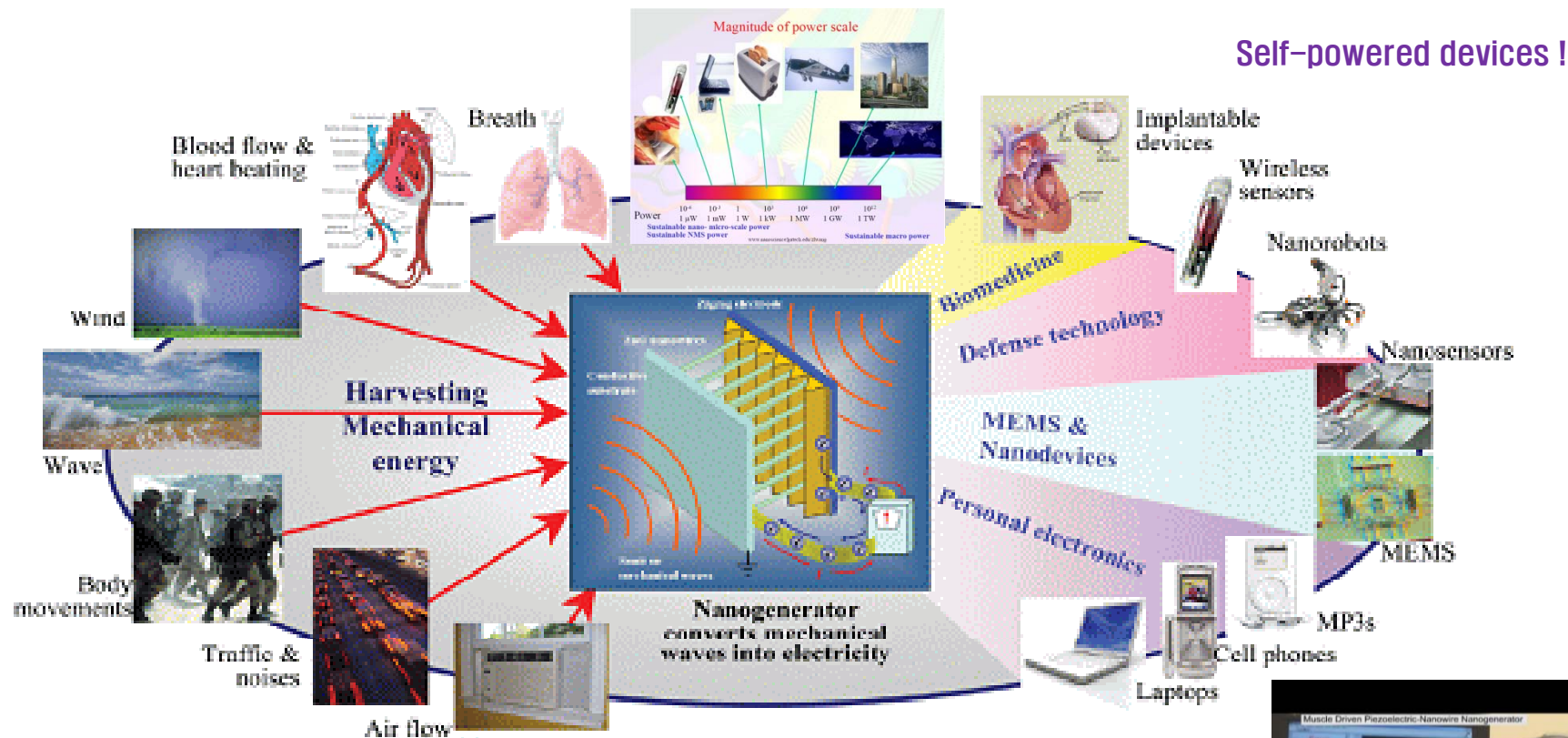


- Nanogenerators
- Hybrid Solar Cells & LEDs
- Hydrogen Storage & Sensors
- Low Power-Driving Chemical Sensors



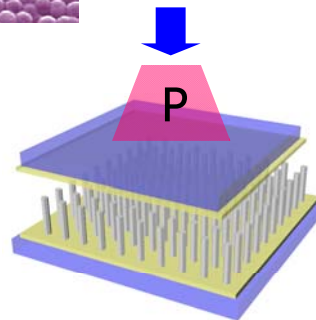
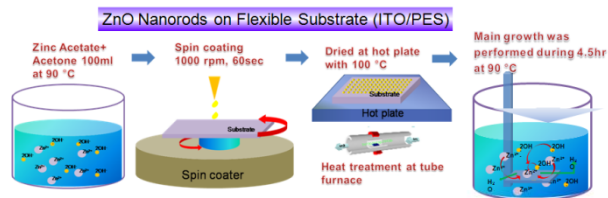
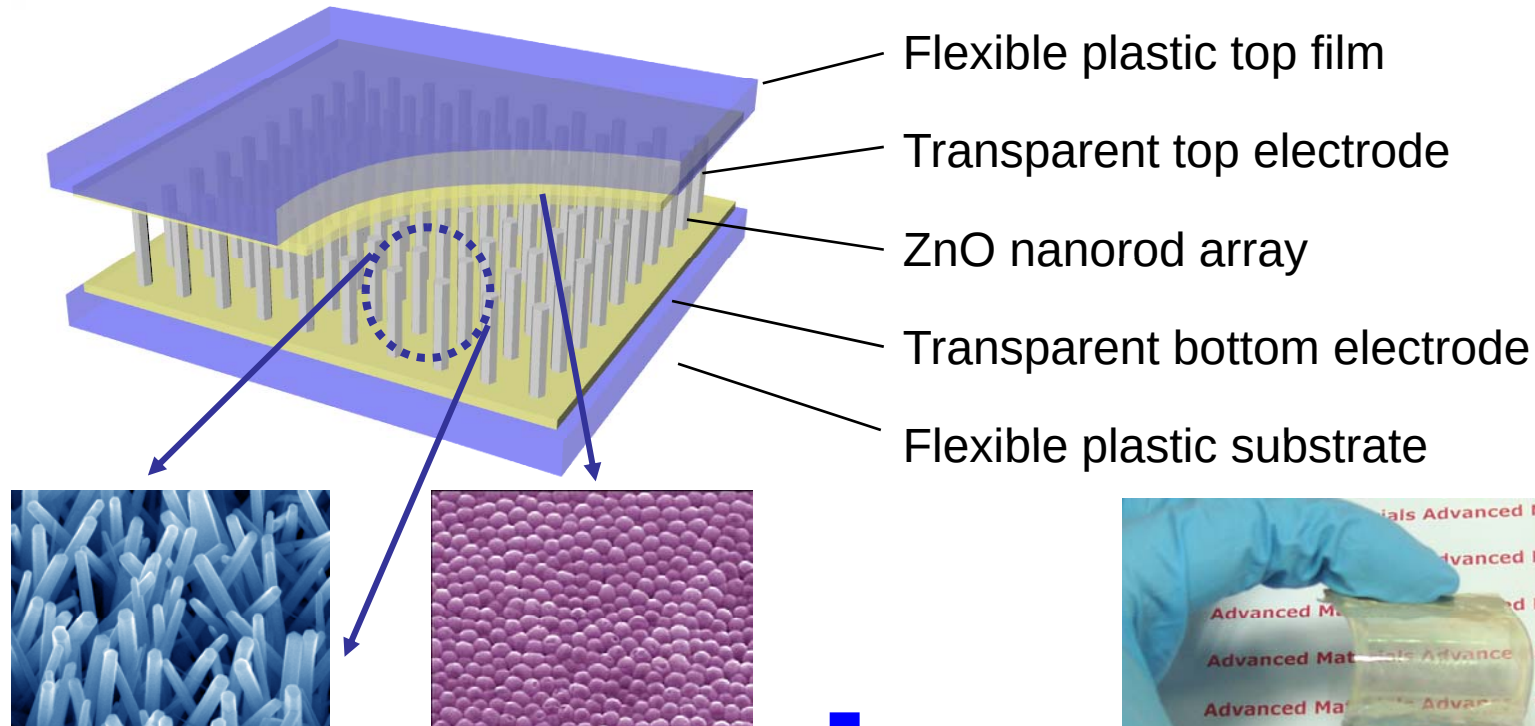
Mechanical Energy Sources for Nanogeneration

New Energy Scavenging from Wasted Energies !



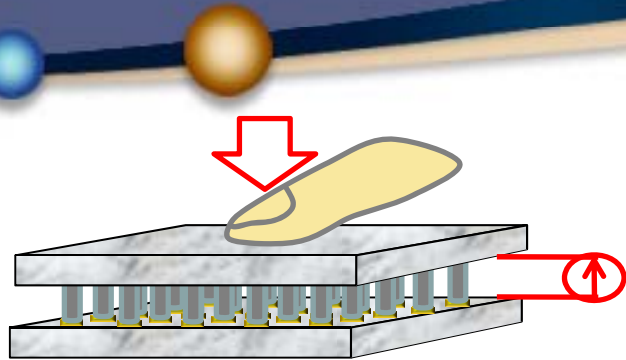
Prof. Z. L. Wang Group [Adv. Funct. Mater. 18, 1 (2008)]

Self-Powered Integrated Transparent Charge Generators



Adv. Mater. 21, 2185 (2009)
Selected as "Advances in Advance"

Applications of Transparent Flexible Nanogenerators



Fingers typing: 6.9-19 mW (M), 1.2-3.2 mW (E)



Power Consumption

Model	Mode
F700 (Samsung)	Resistive
iPhone (Apple)	Capacitive
Prada (LG)	Capacitive



F700 (Samsung)



iPhone (Apple)



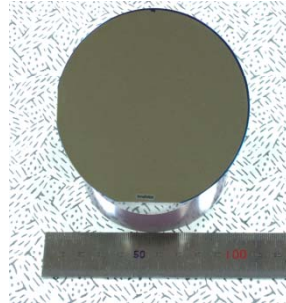
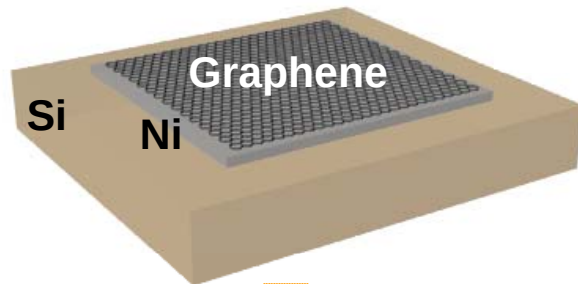
Prade (LG)

Piezoelectric Power Generation : Self-Powered Haptic Sensor Operation



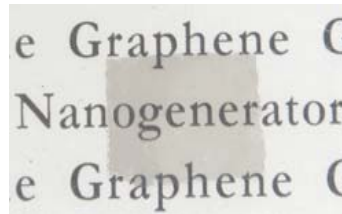
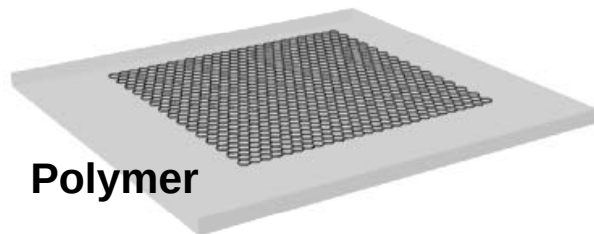
Fabrication Scheme of Fully Rollable Transparent Nanogenerators Based on Graphene Electrodes

(made at Prof. Y. H. Lee's Group, SKKU)

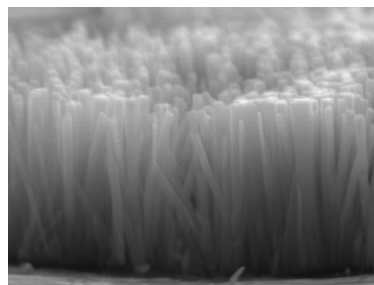
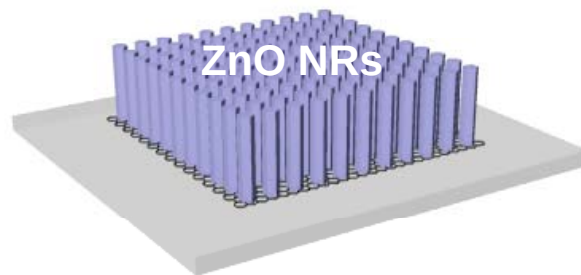


Transfer

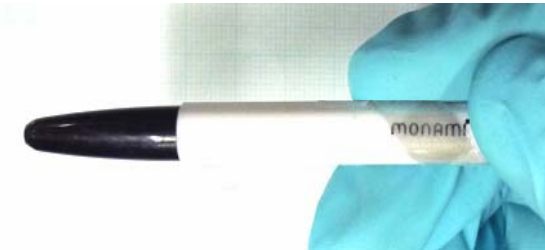
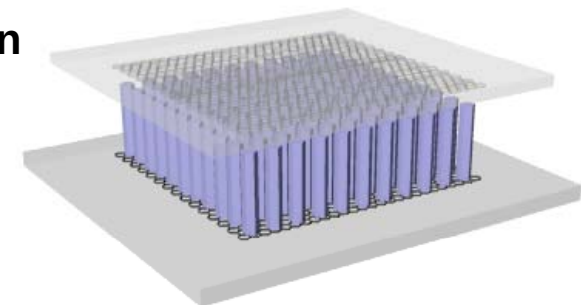
(Dr. J.-Y. Choi's Group, SAIT)



ZnO NRs growth

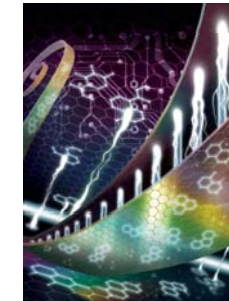
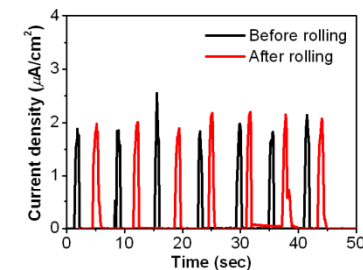


Integration



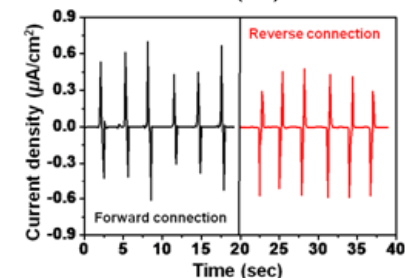
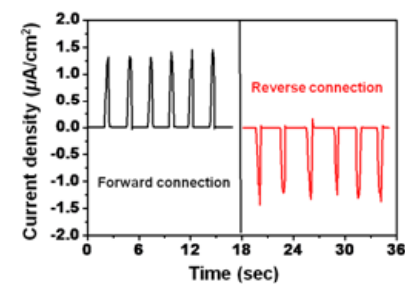
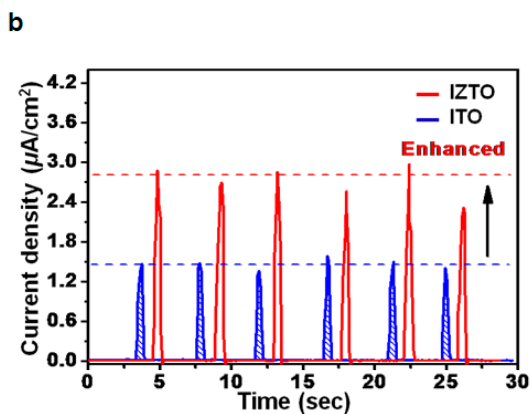
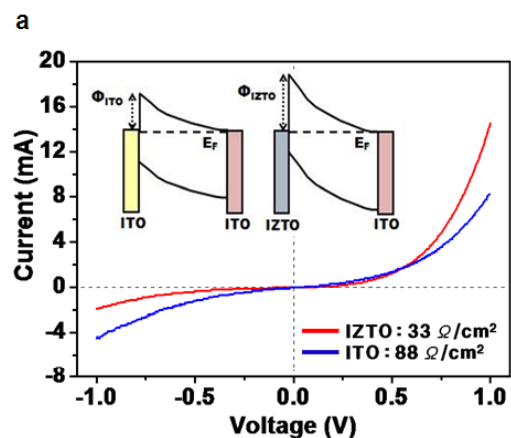
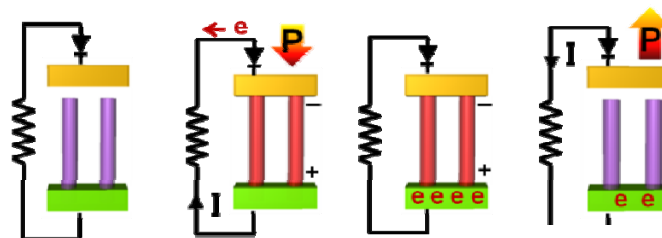
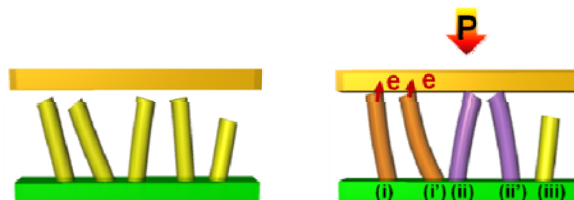
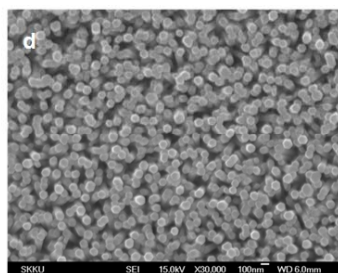
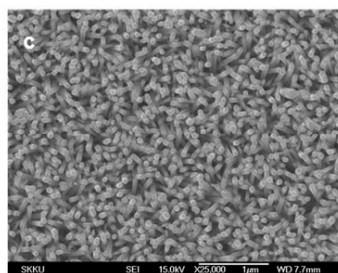
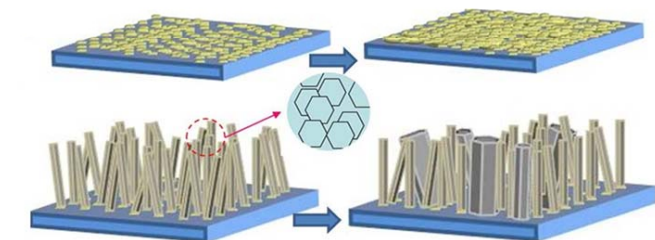
"Fully Rollable Transparent Nanogenerators Based on Graphene Electrodes"

- **Adv. Mater.** (In Press, Cover Suggestion)

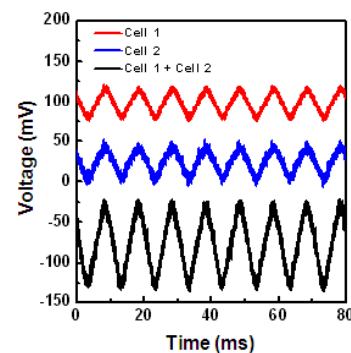
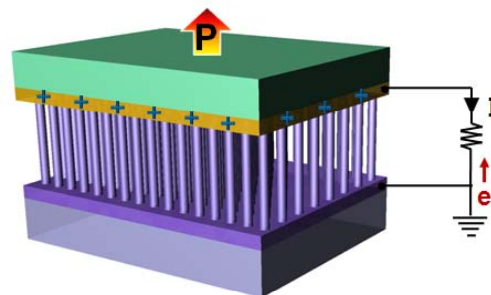
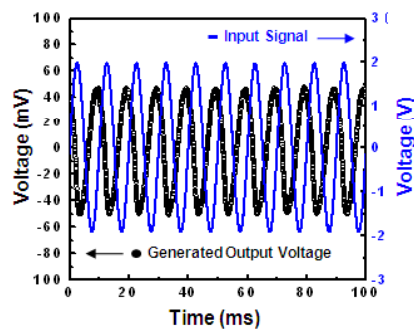
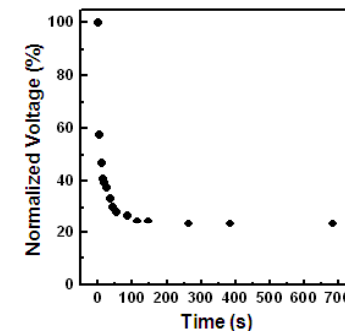
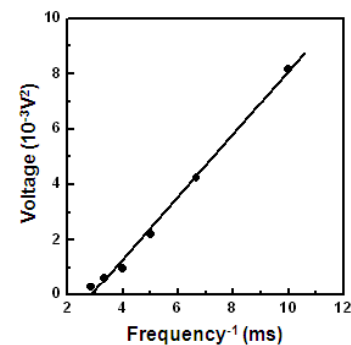
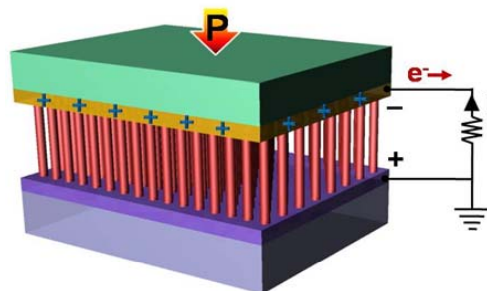
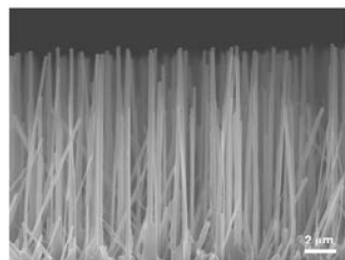
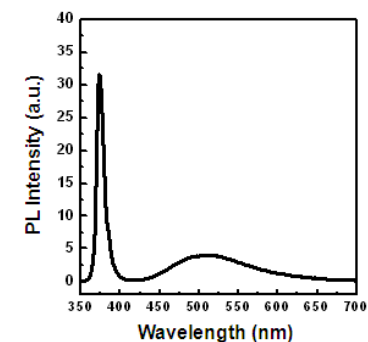
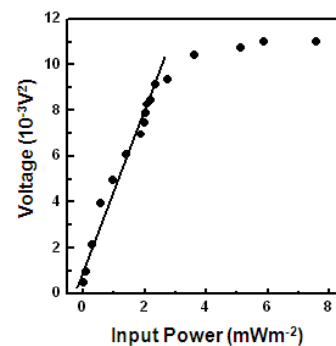
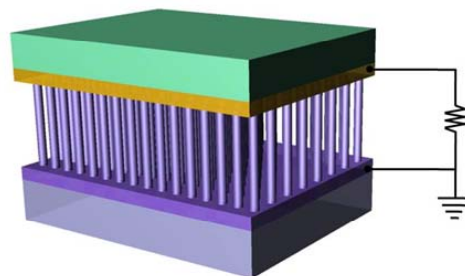
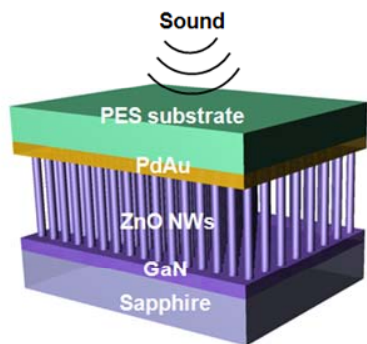


Mode Control & Work Function Dependency (submitted)

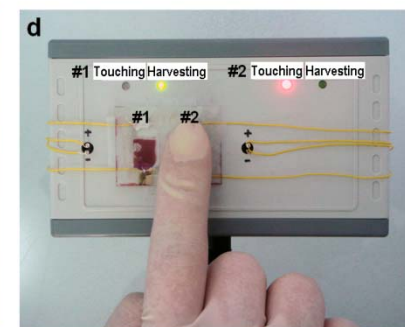
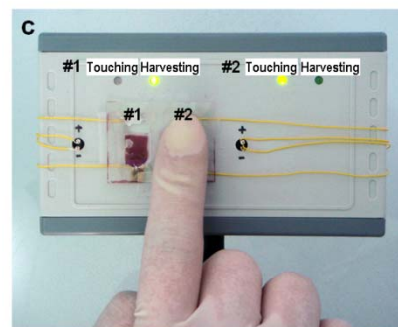
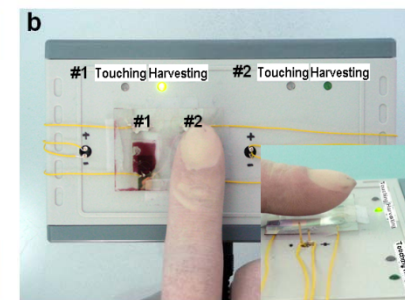
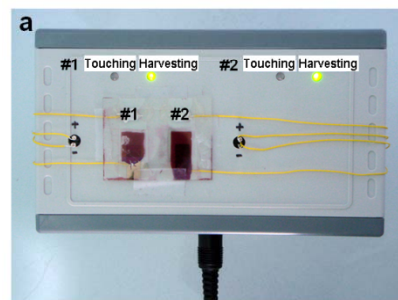
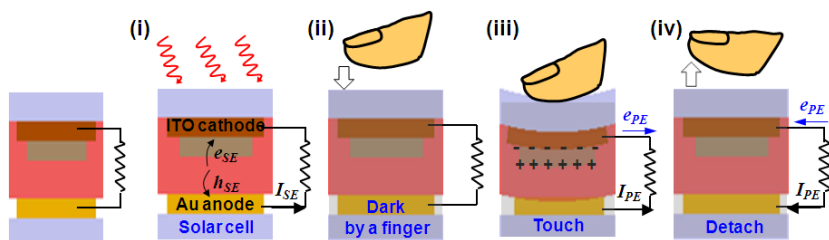
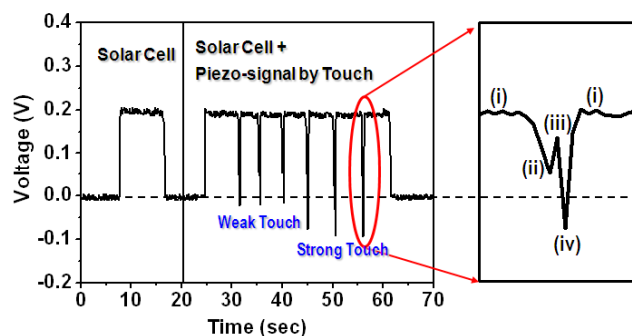
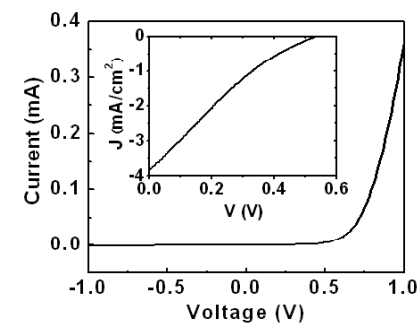
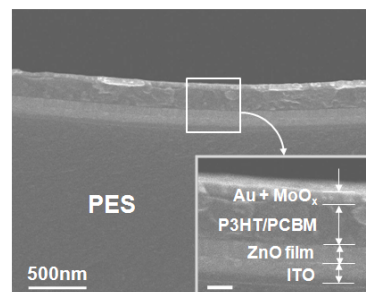
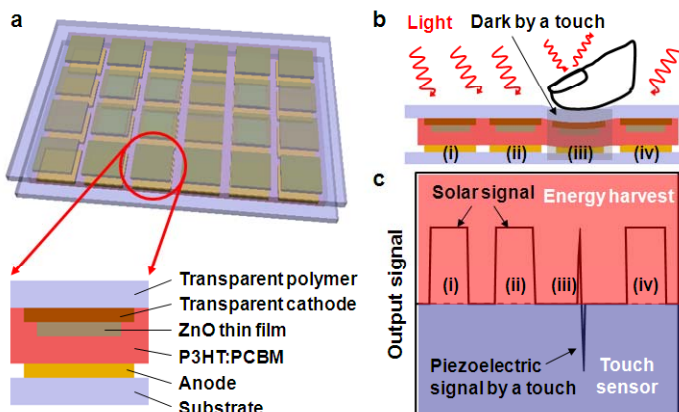
a Seed concentration(0.01M) b Seed concentration(0.03M)



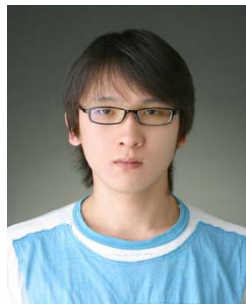
Sound-Driven Piezoelectric Nanogenerators (Under review)



Piezoelectric Touch Sensible Flexible OPV (submitted)



Thank you very much !!!



Recent Core Collaborators: Display Lab. & Frontier Res. Lab. (SAIT), Prof. Z. L. Wang (Gatech), CIGS Solar Cell Group (ETRI), Prof. D.-H. Yoon, Prof. H.-K. Cho (SKKU), Dr. H. H. Lee, Dr. J.-H. Park (PLS), Dr. S. Lee (KIST), Prof. S.-J. Park (GIST), Prof. Sz. Fujita (Kyoto Univ.), Prof. H.-K. Kim (KHU), Prof. S. Maeng (Woosuk Univ.), Prof. W. I. Milne (Cambridge Univ.) Prof. I.-H. Lee (Chonbuk Univ.), Dr. A. Maiti (LLNL), Prof. D.-Y. Jeong (SKKU), Prof. S. Hong (SNU), Prof. C. Cho (PNU), H. Hosono (TIT) etc