

Mijeong Kang

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Education

- 2010 – 2014 Ph.D. in Department of Chemistry, Korea Advanced Institute of Science and Technology
* Advisor: Bongsoo Kim
* Thesis: Single Crystalline Noble Metal Nanowire Electrode: Electrochemical Properties and Biological Applications
- 2008 – 2010 M.S. in Department of Nano Fusion Technology, Pusan National University
* Advisor: Han Young Woo
* Thesis: Signal Amplification of the Fluorescence DNA Sensor Using Water Soluble Conjugated Polymers
- 2004 – 2008 B.S. in School of Nano Science and Technology, Pusan National University

Work Experience

- 2020.09 – present Assistant professor in Dept. of Optics and Mechatronics Engineering, Pusan National University, Korea
- 2018.03 – 2020.08 Postdoctoral researcher in Korea Institute of Materials Science
- 2015.06 – 2018.02 Postdoctoral researcher in University of Maryland, College Park, USA
* PI: Gregory F. Payne
- 2014.11 – 2015.05 Postdoctoral researcher in Korea Research Institute of Bioscience & Biotechnology
- 2014.03 – 2014.10 Postdoctoral researcher in Institute of Basic Science

Research Interest

Biological application research using (spectro)electrochemical methods

- detection of biomolecules in complex biofluid (e.g., clinical serum)
- reverse engineering to analyze biological materials (e.g., antioxidant activity)

- monitoring/controlling cellular events (e.g., exocytosis, oxidative stress)
- delivery of exogenous materials (e.g., gene) into a living cell

Fabrication and characterization of functional electrodes

- nanoscale electrodes using nanomaterials (e.g., metallic nanowire, CNT/graphene/carbon dot)
- nanostructured electrodes (e.g., metallic nanopillar substrate)
- modification of electrode surface (e.g., electrodeposition)

Publication List

1. H. Kim, K. Nam, J. Park, **M. Kang**, J.-S. Bae, W. T. Hong, H. K. Yang, J. H. Jeong, J. H. Oh, S. Lee,* "Hydrogen-mediated manipulation of luminescence color in single-component Eu doped CaYAlSiO₄ by defect passivation" *J. Alloys Compd.* **2023**, 932, 167610.
2. T. Rajarathinam, D. Thirumalai, S. Jayaraman, S. Kim, M. Kwon, H.-J. Paik, S. Kim, **M. Kang**, S.-C. Chang,* "Enzyme Nanosheet-Based Electrochemical Aspartate Biosensor for Fish Point-of-Care Applications" *Micromachines* **2022**, 13, 1428.
3. M.-R. Kim, T. C. Pham, Y. Choi, S. Yang, H.-S. Yang, S. H. Park, **M. Kang**, S. Lee,* "Syntheses and Photovoltaic Properties of New Pyrazine-Based Organic Photosensitizers for Dye-Sensitized Solar Cells" *Energies* **2022**, 15, 5938.
4. S. Lee,* **M. Kang**,* "Graphene for Nanobiosensors and Nanobiochips" *Adv. Exp. Med. Biol.* **2022**, 1351, 203–232.
5. **M. Kang**,* K. Chai, "Wearable Sensing Systems for Monitoring Mental Health", *Sensors* **2022**, 22, 994.
6. I. B. Ansah, W.-C. Lee, C. Mun, J.-J. Rha, H. S. Jung, **M. Kang**, S.-G. Park,* D.-H. Kim,* "In situ electrochemical surface modification of Au electrodes for simultaneous label-free SERS detection of ascorbic acid, dopamine and uric acid" *Sens. Actuator B-Chem.* **2022**, 353, 131196.
7. J. H. Oh, J. Park, **M. Kang**, S. C. Jung, I. Takeuchi, J. H. Jeong, S. Lee,* "Side reaction in the hydrogen and carbothermal reductions of BaO and BaCO₃: the role of an infinitesimal amount of water" *Curr. Appl. Phys.* **2022**, 34, 19–23.
8. I. B. Ansah, D. Aranda, H. S. Jung, S.-G. Park, **M. Kang**,* J. C. Otero,* D.-H. Kim,* "Dual synergistic modulation of photo-induced electron transfer processes between molecules and gold nanopillars for ultrasensitive plasmon-enhanced Raman scattering" *J. Mater. Chem. C* **2021**, 9, 8842–8848 (Cover highlight)
9. **M. Kang**,* Y. Jo, C. Mun, J. Yeom, J. S. Park, H. S. Jung, D.-H. Kim, S.-G. Park,* S. M. Yoo, "Nanoconfined 3D redox capacitor-based electrochemical sensor for ultrasensitive

- monitoring of metabolites in bacterial communication” *Sens. Actuator B-Chem.* **2021**, 345, 130427.
10. **M. Kang**,* C. Mun, H. S. Jung, I. B. Ansah, E. Kim, H. Yang, G. F. Payne, D.-H. Kim,* S.-G. Park, “Tethered molecular redox capacitors for nanoconfinement-assisted electrochemical signal amplification” *Nanoscale* **2020**, 12, 3668–3676. (Cover highlight)
 11. E. Kim, Z. Keskey, **M. Kang**, C. Kitchen, W. E. Bentley, S. Chen, D. L. Kelly, G. F. Payne,* “Validation of oxidative stress assay for schizophrenia” *Schizophrenia Research* **2019**, 212, 126–133.
 12. E. Kim, **M. Kang** (co-first), H. Liu, C. Cao, C. Liu, W. E. Bentley, X. Qu, G. F. Payne,* “Pro- and Anti-oxidant Properties of Redox-Active Catechol-Chitosan Films”, *Front. Chem.* **2019**, 7, 541.
 13. E. Kim, J. Li, **M. Kang**, D. L. Kelly, S. Chen, A. Napolitano, L. Panzella, X. Shi, K. Yan, S. Wu, J. Shen, W. E. Bentley, G. F. Payne,* “Redox Is a Global Biodevice Information Processing Modality” *Proc. IEEE* **2019**, 107, 1402–1424.
 14. W.-H. Park*, S.-G. Park, **M. Kang**, M. S. Hyun, N. Choi, D.-H. Kim*, J. Choo*, “Direct visualization of a surface-enhanced Raman spectroscopy nano-gap via electrostatic force microscopy: Dependence on charge transfer from the underlying surface nano-gap distance” *Appl. Surf. Sci.* **2019**, 479, 874–878.
 15. K. Park, M. S. Kim, **M. Kang**, T. Kang,* B. Kim,* S. T. Lee, “Successful genetic modification of porcine spermatogonial stem cells via an electrically responsive Au nanowire injector”, *Biomaterials* **2019**, 193, 22–29.
 16. **M. Kang**, E. Kim, Z. Temoçin, J. Li, E. Dadachova, Z. Wang, L. Panzella, A. Napolitano, W. E. Bentley, G. F. Payne,* “Reverse Engineering to Characterize Redox Properties: Revealing Melanin’s Redox Activity through Mediated Electrochemical Probing” *Chem. Mater.* **2018**, 30, 5814–5826.
 17. C. Cao, E. Kim, Y. Liu, **M. Kang**, J. Li, J.-J. Yin, H. Liu, X. Qu, C. Liu, W. E. Bentley, G. F. Payne,* “Radical Scavenging Activities of Biomimetic Catechol-Chitosan Films”, *Biomacromolecule* **2018**, 19, 3502–3514.
 18. S.-G. Park,* **M. Kang** (co-first), S. Kim, H. S. Jung, D.-H. Kim,* “3D-assembled Ag nanowires for use in plasmon-enhanced spectroscopic sensors”, *Appl. Spectrosc. Rev.* **2018**, 4, 1–23.
 19. **M. Kang**, E. Kim, S. Chen, W. E. Bentley, D. L. Kelly, G. F. Payne,* “Signal processing approach to probe chemical space for discriminating redox signatures”, *Biosens. Bioelectron.* **2018**, 112, 127–135.
 20. T. Winkler, F. Stevenson, E. Kim, **M. Kang**, G. Payne, D. Kelly, and R. Ghodssi,* “The Role of Microsystems Integration Towards Point-of-Care Clozapine Treatment Monitoring in Schizophrenia”, *IEEE Sensors Letters* **2017**, 2, 5500304.
 21. E. Kim, **M. Kang**, T. Tschirhart, M. Malo, E. Dadachova, G. Cao, J.-J. Yin, W. E. Bentley, Z. Wang, G. F. Payne,* “Spectroelectrochemical Reverse Engineering Demonstrates That Melanin’s Redox and Radical Scavenging Activities Are Linked”, *Biomacromolecules* **2017**, 18, 4084–4098.

22. K. Park, K. C. Kim, H. Lee, Y. Sung, **M. Kang**, Y. M. Lee, J. Y. Ahn, J. M. Lim, T. Kang, B. Kim, E.* J. Lee,* “Suppressing Mosaicism by Au Nanowire Injector-Driven Direct Delivery of Plasmids into Mouse Embryos”, *Biomaterials* **2017**, *138*, 169–178.
23. **M. Kang**, E. Kim, T. E. Winkler, G. Banis, Y. Liu, C. A. Kitchen, D. L. Kelly, R. Ghodssi, G. F. Payne,* “Reliable clinical serum analysis with reusable electrochemical sensor: toward point-of-care measurement of the antipsychotic medication clozapine”, *Biosens. Bioelectron.* **2017**, *95*, 55–59.
24. B. Ahn, J. Schötz, **M. Kang**, W. A. Okell, S. Mitra, B. Förg, S. Zherebtsov, F. Süßmann, C. Burger, M. Kübel, C. Liu, A. Wirth, E. Di Fabrizio, H. Yanagisawa, D. Kim,* B. Kim,* M. F. Kling,* “Attosecond-Controlled Photoemission from Metal Nanowire Tips in the Few-Electron Regime”, *APL Photonics* **2017**, *2*, 36104.
25. Y. Liu, E. Kim, J. Li, **M. Kang**, W. E. Bentley, G. F. Payne,* “Electrochemistry for Bio-Device Molecular Communication: The Potential to Characterize, Analyze and Actuate Biological Systems”, *Nano Commun. Netw.* **2017**, *11*, 76–89.
26. E. Kim, T. E. Winkler, C. Kitchen, **M. Kang**, G. Banis, W. E. Bentley, D. L. Kelly, R. Ghodssi, G. F. Payne,* “Redox probing for chemical information of oxidative stress”, *Anal. Chem.* **2017**, *89*, 1583–1592.
27. J. Y. Lee, B.-K. Kim,* **M. Kang**, J. H. Park,* “Label-free detection of single living bacteria via electrochemical collision event”, *Sci. Rep.* **2016**, *6*, 30022
28. Z. Liang, **M. Kang**, G. F. Payne,* X. Wang,* R. Sun, “Probing energy and electron transfer mechanisms in fluorescence quenching of biomass carbon quantum dots”, *ACS Appl. Mater. Interfaces* **2016**, *8*, 17478–17488.
29. C. Shin, H. Bae, **M. Kang**, B. Kim,* S. J. Kwon,* “Direct observation of single Pt nanoparticle collision onto single-crystalline gold nanowire electrodes”, *Chem.-Asian J.* **2016**, *11*, 2181–2187.
30. **M. Kang**, S. M. Yoo, R. Gwak, G. Eom, J. H. Kim, S. Y. Lee,* B. Kim,* “Electro-triggering and electrochemical monitoring of dopamine exocytosis from a single cell by ultrathin Au nanowire electrodes”, *Nanoscale* **2015**, *8*, 214–218.
31. R. Praveenkumar, R. Gwak, **M. Kang**, T. S. Shim, S. Cho, J. Lee, Y.-K. Oh, K. Lee,* B. Kim,* “Regenerative astaxanthin extraction from a single microalgal (*Haematococcus pluvialis*) cell using a gold nano-scalpel”, *ACS Appl. Mater. Interfaces* **2015**, *7*, 22702–22708.
32. B. Hwang, **M. Kang** (co-first), S. Lee, C. R. Weinberger, P. Loya, J. Lou, S. H. Oh, B. Kim,* S. M. Han,* “Effect of surface energy on size-dependent deformation twinning of defect-free Au nanowires”, *Nanoscale* **2015**, *7*, 15657–15664.
33. S. Kim, G. Eom, **M. Kang**, T. Kang, H. Lee, A. Hwang, H. Yang,* B. Kim,* “Composition-selective fabrication of ordered intermetallic Au-Cu nanowires and their application to nano-size electrochemical glucose detection”, *Nanotechnology* **2015**, *26*, 245702.
34. **M. Kang**, H. Lee, T. Kang, B. Kim.* “Synthesis, Properties, and Biological Application of Perfect Crystal Gold Nanowires: A Review”, *J. Mater. Sci. Technol.* **2015**, *31*, 573–580.

35. **M. Kang**, B. Kim,* "Au Nanoinjectors for Electrotriggered Gene Delivery into the Cell Nucleus", *The Nucleus*. Springer New York, **2015**. 55–65.
36. **M. Kang**, S. Jung, H. Zhang, T. Kang, H. Kang, Y. Yoo, J.-P. Hong, J.-P. Ahn, J. Kwak, D. Jeon,* N. A. Kotov,* B. Kim,* "Subcellular neural probes from single crystal gold nanowires", *ACS Nano* **2014**, *8*, 8182–8189.
37. I. Kim, K. Kyhm,* **M. Kang**, H. Y. Woo, "Ultrafast combined dynamics of Förster resonance energy transfer and transient quenching in cationic polyfluorene/fluorescein-labelled single-stranded DNA complex", *J. Lumin.* **2014**, *149*, 185–189.
38. S. M. Yoo, **M. Kang** (co-first), T. Kang, D. Kim, S. Y. Lee,* B. Kim,* "Electrotriggered, spatioselective, quantitative gene delivery into a single cell nucleus by Au nanowire nanoinjector", *Nano Lett.* **2013**, *13*, 2431–2435.
39. K. Kyhm,* I. Kim, **M. Kang**, H. Y. Woo,* "Ultrafast dynamics of Forster resonance energy transfer and photo-induced charge transfer in cationic polyfluorene/dyelabeled DNA complex", *J. Nanosci. Nanotech.* **2012**, *12*, 7733–7738.
40. T. Kang, S. M. Yoo, **M. Kang**, H. Lee, H. Kim, S. Y. Lee,* B. Kim,* "Single-step multiplex detection of toxic metal ions by au nanowires-on-chip sensor using reporter elimination", *Lab Chip.* **2012**, *12*, 3077–3081.
41. B. Kim, I. H. Jung, **M. Kang**, H.-K. Shim,* H. Y. Woo,* "Cationic conjugated polyelectrolytes-triggered conformational change of molecular beacon aptamer for highly sensitive and selective potassium ion detection", *J. Am. Chem. Soc.* **2012**, *134*, 3133–3138.
42. S. Yoo, T. Kang, H. Kang, H. Lee, **M. Kang**, S. Y. Lee,* B. Kim,* "Combining NW SERRS sensor and target recycling reaction for ultrasensitive and multiplex identification of pathogenic fungi", *Small* **2011**, *7*, 3371–3376.
43. **M. Kang**, O. K. Nag, S. Hwang, I. Kim, H. Yang, K. Kyhm, H. Y. Woo,* "Solvent-assisted optical modulation of FRET-induced fluorescence for efficient conjugated polymer-based DNA detection", *Phys. Chem. Chem. Phys.* **2010**, *12*, 15482–15489.
44. O. K. Nag, **M. Kang**, S. Hwang, H. Suh, H. Y. Woo,* "Counterion effects on fluorescence energy transfer in conjugated polyelectrolyte-based DNA detection", *J. Phys. Chem. B* **2009**, *113*, 5788–5793.
45. R. R. Nayak, O. K. Nag, **M. Kang**, Y. Jin, H. Suh, K. Lee, H. Y. Woo,* "A micellar complex of a conjugated polyelectrolyte for efficient FRET to dye-labeled DNA", *Macromol. Rapid Commun.* **2009**, *30*, 633–638.
46. **M. Kang**, O. K. Nag, R. R. Nayak, S. Hwang, H. Suh, H. Y. Woo,* "Signal amplification by changing counterions in conjugated polyelectrolyte- based FRET DNA detection", *Macromolecules* **2009**, *42*, 2708–2714.

Academic Activities

International conference

1. **M. Kang**, H. S. Jung, S.-G. Park, D.-H. Kim, "Novel Utilization of Nano-Confinement Effect of Nanostructured Au—Surface-Bound Redox Cycling-Assisted Signal Amplification" *2019 MRS Spring Meeting and Exhibit*, Apr. 2019.
2. T. E. Winkler, E. Kim, **M. Kang**, G. F. Payne, D. L. Kelly, R. Ghodssi, "Systems Integration of Cellular and Molecular Sensing towards Point-of-Care Treatment Monitoring in Schizophrenia", *MicroTAS: The 21st International Conference on Miniaturized Systems for Chemistry and Life Sciences*, Oct. 2017.
3. **M. Kang**, D. Kelly, "Therapeutic Drug Monitoring With Clozapine: Electrochemical Sensing Development", *Schizophr. Bull.*, Mar. 2017.
4. **M. Kang**, H. Kang, T. Kang, J. Kwak, B. Kim, "Fabrication and Characterization of Single-Crystalline Au Nanowire Electrodes and its Biological Application", *IEEE Nanotechnology Materials and Devices Conference*, Oct. 2011.
5. **M. Kang**, O. K. Nag, R. R. Nayak, S. Hwang, H. Suh, H. Y. Woo, "Water-soluble polyfluorene copolymers with different counterions for signal amplification in FRET-based DNA detection", *American Chemical Society, 238th ACS National Meeting & Exposition*, Aug. 2009.
6. **M. Kang**, O. K. Nag, H. Y. Woo, "Solvent effects on FRET to fluorophore-labeled DNA in conjugated polyelectrolytes-based biosensors", *Korean-Japanese-Chinese student workshop (Pusan National University-Shizuoka University)*, Oct. 2008.
7. R. R. Nayak, O. K. Nag, **M. Kang**, H. Y. Woo, "Nanowire micellar complex of cationic polyfluorene copolymer and nonionic surfactants for optimized FRET-based DNA sensors", *Veeco Instruments, Seeing at the Nanoscale VI*, Jul. 2008.
8. **M. Kang**, O. K. Nag, R. R. Nayak, H. Y. Woo, "Structure Optimization of water-soluble conjugated polymers for efficient FRET-based DNA detection", *Korean-Japanese-Chinese student workshop (Pusan National University-Shizuoka University-Nankai University)*, Oct. 2007.

Domestic conference

1. **M. Kang**, C. Mun, H. S. Jung, I. B. Ansah, D.-H. Kim, S.-G. Park "Nanoconfinement-augmented Redox Cycle Reaction in Nanostructured Electrodes", *2019 Spring Meeting of the Korean Electrochemistry Society*, Apr. 2019
2. **M. Kang**, S. Y. Lee, B. Kim, "Noble nanoinjector-based electrochemical gene delivery into a single cell nucleus", *The 111th Korean Chemical Society*, Apr. 2013.
3. **M. Kang**, H. Kang, J. Kwak, B. Kim, "Au nanowire electrodes: The smallest implant for recording neural signal", *The 110th Korean Chemical Society*, Oct. 2012.
4. **M. Kang**, B. Kim, "Direct electrochemical sensing of glucose at single-crystalline Au nanowire electrodes", *The 108th Korean Chemical Society*, Sep. 2011.
5. **M. Kang**, T. Kang, J. Kwak, B. Kim, "Fabrication and characterization of single-

- crystalline Au nanowire electrode”, *The 107th Korean Chemical Society*, Apr. 2011.
6. **M. Kang**, I. H. Jeong, H.-K. Shim, H. Y. Woo, “Effects of charge density of conjugated polymer on fluorescence resonance energy transfer-based biosensor signal”, *The Polymer Society of Korea*, Oct. 2009.
 7. **M. Kang**, H. Y. Woo, “Enhanced FRET-induced signal amplification in DNA sensor by controlling charge density of water-soluble cationic conjugated polymers”, *The 103rd Korean Chemical Society*, Apr. 2009.
 8. **M. Kang**, H. Y. Woo, “Solvent effects on FRET to fluorophore-labeled DNA in conjugated polyelectrolytes-based biosensors”, *The 102nd Korean Chemical Society*, Oct. 2008.
 9. **M. Kang**, H. Y. Woo, “Structure modification of water-soluble conjugated polymers for enhanced sensitivity of FRET-based DNA detection”, *The Polymer Society of Korea*, Apr. 2008.
 10. **M. Kang**, H. Y. Woo, “Structure optimization of water-soluble conjugated polymers for efficient FRET-based DNA detection”, *The 100th Korean Chemical Society*, Oct. 2007.

Patent List

1. E. J. Lee, B. Kim, K. C. Kim, **M. Kang**, K. Park, “Method for Injecting Biomaterial into Fertilized Egg Nucleus”, Korea Patent #101750611000.
2. B. Kim, **M. Kang**, “Electrode for measuring neural signal including single-crystalline au nanowire”, Korea Patent #1015033910000.
3. B. Kim, **M. Kang**, “Nano injector including single-crystalline au nanowire, and equipment for delivering biomaterial including the same”, Korea Patent #1014807800000.
4. B. Kim, **M. Kang**, T. Kang, “Transition metal nanoelectrode and a method of fabricating thereof”, Korea Patent #1013589890000.
5. H. Y. Woo, H.-K. Shim, B. Kim, **M. Kang**, I. H. Jung, “Method for detecting target material based on cationic conjugated polyelectrolyte”, Korea Patent #1013123540000.
6. H. Y. Woo, **M. Kang**, “A FRET system using DMSO solvent and a detection method of nucleic acid using the same”, Korea Patent #1012383780000.
7. H. Y. Woo, **M. Kang**, O. K. Nag, R. R. Nayak, “Conjugated polymer FRET system and biosensor by exchanging counterion”, Korea Patent #1009974110000.