

# Curriculum Vitae

**Name** : **Seung Soo Oh** (오승수)  
**Address** : Department of Materials Science and Engineering, 77 Cheongam-Ro, Nam-Gu,  
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## Education

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- 09.2007~12.2012** Ph.D. in Materials, University of California, Santa Barbara, U.S.A.  
**Advisor:** Prof. H. Tom Soh  
**Thesis:** Advancements in directed evolution techniques towards nucleic acid materials with complex functionalities
- 09.2005~08.2007** M.S. in Materials Science and Engineering, Seoul National University, Seoul, Korea  
**Advisor:** Prof. Euijoon Yoon  
**Thesis:** Ultra-fast In nanowire growth by focused ion beam irradiation
- 03.1998~02.2005** B.S. in Materials Science and Engineering, Seoul National University, Seoul, Korea  
*Summa cum laude*
- 03.1995~02.1998** Seoul Science High School, Seoul, Korea

## Experiences

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### Research:

- 2020~present** **Associate professor**, Pohang University of Science and Technology (POSTECH), Korea  
Department of Materials Science and Engineering  
  
**Adjunct professor**, Pohang University of Science and Technology (POSTECH), Korea  
Department of Chemical Engineering  
School of Interdisciplinary Bioscience and Bioengineering (i-bio)  
Division of Environmental Science and Engineering
- Adjunct professor**, Yonsei University, Korea  
Institute for Convergence Research and Education in Advanced Technology (I-CREATE)
- 2016~2020** **Assistant professor**, Pohang University of Science and Technology (POSTECH), Korea  
Department of Materials Science and Engineering
- 2014~2016** **Research fellow**, Massachusetts General Hospital/Harvard Medical School, Boston  
Howard Hughes Medical Institute  
**PI:** Prof. Jack W. Szostak (Nobel Laureate 2009)
- 2012~2014** **Postdoctoral researcher**, Institute for Collaborative Biotechnologies, Santa Barbara  
**PI:** Prof. H. Tom Soh and Prof. Craig J. Hawker
- 2007~2012** **Graduate student researcher**, University of California, Santa Barbara  
**PI:** Prof. H. Tom Soh
- 2005~2007** **Research assistant**, Seoul National University, Seoul, Korea  
**PI:** Prof. Euijoon Yoon

### Teaching:

- 2022~present** AMSE199(Freshmen Research Participation), POSTECH
- 2020~2022** AMSE201(Fundamentals of Materials Science and Engineering), POSTECH
- 2017~present** AMSE490B/AMSE207(core class, Materials Chemistry), POSTECH
- 2017~present** AMSE463 (Polymer Design and Laboratory), POSTECH
- 2016~present** AMSE721C/AMSE561 (Nucleic Acid Biomaterials and Nanobiotechnologies), POSTECH
- 2008** Teaching assistant in ME 6 (Electric Circuits), University of California, Santa Barbara
- 2005** Teaching assistant in Introduction of LED engineering, Seoul National University

1999-2005 Instructor in physical training class (ski), Korea

### Professional Activity:

2022~present Associate Editor, *Macromolecular Research*  
2022~present Financial Officer (재무이사), The Polymer Society of Korea  
2023~present Chairman for the Division of Biomaterials, The Korean BioChip Society  
2023~present Chairman for the Division of Integrative Biomaterials, The Korean Ceramic Society  
2019~2022 Operating Committee (운영이사), The Polymer Society of Korea  
2020~2021 Young Scientist Board, The Korean Society for Biomaterials  
2017~2019 Editorial Board, *BT NEWS*, The Korean Society for Biotechnology and Bioengineering  
2017~2018 Editorial Board, *Polymer Science and Technology* (고분자 과학과 기술), The Polymer Society of Korea

### Honors and Awards

2023 Mid-Career Researcher Award, The Polymer Society of Korea  
2023 Best Teaching Award, Department of Materials Science and Engineering, POSTECH  
2020 Samsung Research Funding, Samsung Incubation Center for Future Technology, Korea  
2019 Il-Beom Chaired Professorship, POSTECH, Korea  
2013 Young Investigator Award, Baxter International Corp.  
2012 Graduate Student Award, Materials Research Society (MRS)  
2011 Grand Challenge Award, The 12<sup>th</sup> Annual UC Systemwide Bioengineering Symposium  
2011 Graduate Division Dissertation Fellowship, U. C. Santa Barbara  
2009-2010 President, Korean Graduate Student Association at U. C. Santa Barbara  
2007-2010 Doctoral Study Abroad Fellowship, Kwanjeong Educational Foundation  
2006 Best Poster Presentation Award,  
The 13<sup>th</sup> International Symposium on the Physics of Semiconductors and Application  
2005 Best Student Award (금속동창회장상: 재료공학부 최우수 졸업상),  
Alumni Association of Metallurgical Engineering at Seoul National University, Korea  
2005 Commendation of the Top Graduate (최우수 졸업 표창),  
Alumni Association of Engineering at Seoul National University, Korea  
2005 Summa cum laude, Seoul National University, Korea  
2004 Full College Student Scholarship (2 awards), Seoul National University, Korea  
2004 Elected as a LG Global Challenger (Overseas Exploration Program), LG Corp.  
1998-1999, 2003 College Student Scholarship (5 awards), Seoul National University, Korea  
1997 Top Award in Chemistry (과학기술처장관상), National Science Fair, Korea

### Research Interests

- Proteomimetics and cytomimetics with sequence-controlled biopolymers
- Generation and applications of molecular recognition elements (**aptamers**), molecular catalysts (**ribozymes/DNAzymes**) and molecular machines (**riboswitches/structure-switching aptamers**)
- Viral neutralization of binding tolerance by receptor mimicking
- Ultra-site-specific bioconjugation by enzyme mimicking
- Selective ion filtration by ion channel mimicking
- Molecular transducers for synthetic biology
- Origins of life

### Publications

Papers: (total citation: **2341**; h-index: **23** and i10-index: **29** as of Jul. 29<sup>th</sup>, 2023)

\*: Co-first authors

#: Co-corresponding authors

- 53) S. Cheon, W.-J. Cho, G.-R. Yi, B. Kang#, **S. S. Oh**#, "Ultrafast and Reversible Superwettability Switching of 3D Graphene Foams via Solvent-Exclusive Plasma Treatments", (2023, *submitted*)  
52) M. W. Kim, S. H. Yu, U. Yang, R. Nukiwa, H. J. Cho, N. S. Kwon, M. J. Yong, N. H. Kim, S. H. Lee, J. H. Lee, J. H. Lim, Y. Kohmura, T. Ishikawa, F. S. Henry, Y. Imai, **S. S. Oh**, H. J. Hwang, A. Tsuda, J. H. Je, "Alveolar microdynamics during tidal ventilation in live animals imaged by Spring-8 synchrotron", (2023, *submitted*)

- 51) B. Kang\*, S. V. Park\*, **S. S. Oh**, "Ionic liquid-caged nucleic acids enable active folding-based molecular recognition with hydrolysis resistance ", *Nucleic Acids Research* (2023, in revision)
- 50) H. Yoo, H.-R Lee, S.-B. Kang, J. Lee, K. Park, H. Yoo, J. Kim, T. D. Chung, K.-M. Lee, H.-H. Lim, C. Y. Son, J.-Y. Sun, **S. S. Oh**, "G-quadruplex-filtered selective ion-to-ion current amplification for non-invasive ion monitoring in real time ", *Advanced Materials*, **35**, 2303655 (2023)
- 49) M. Kim\*, H. Jo\*, G. Y. Jung, **S. S. Oh**, "Molecular complementarity of proteomimetic materials for target-specific recognition and recognition-mediated complex functions", *Advanced Materials*, **35**, 2208309 (2023)
- 48) S. Y. Moon, S-H. Son, **S. S. Oh**, J. Y. Lee, "Harnessing cellular organelles to bring new functionalities into yeast", *Biotechnology and Bioprocess Engineering*, <https://doi.org/10.1007/s12257-022-0195-5> (2023)
- 47) U. Yang\*, B. Kang\*, M.-J. Yong\*, J. H. Je, **S. S. Oh**, "Type-Independent 3D Writing and Nano-Patterning of Confined Biopolymers ", *Advanced Science*, **10**, 2207403 (2023)
- 46) K. Kim, J. Min, M. Lee, G. Sim, **S. S. Oh**, M. J. Park, "Porous charged polymer nanosheets formed via microplastic removal from frozen ice for virus filtration and detection", *Nanoscale*, **14**, 17157 (2022)
- 45) M. Lee, B. Kang, J. Lee, S. T. Jung, **S. S. Oh**, "De novo selected hACE2 mimics that integrate hot-spot peptides with aptameric scaffolds for binding tolerance of SARS-CoV-2 variants" *Science Advances*, **8**, eabq6207 (2022)
- 44) H. Jo, J. Byeon, **S. S. Oh**, "Selective RNA labeling by RNA-compatible Type II restriction endonuclease and RNA-extending DNA polymerase", *Life*, **12**, 1674 (2022)
- 43) B. Kang\*, G. Park\*, S. H. Kim, D. Lee, **S. S. Oh**, "Noncovalent minimal assembly of exogenous histamine with hemin cofactor as a peroxidase-mimicking cooperative catalyst", *iScience*, **25**, 105257 (2022)
- 42) M.-J. Yong\*, B. Kang\*, U. Yang\*, **S. S. Oh**, J. H. Je#, "Live streaming of a single cell's life over a local pH-monitoring nanowire waveguide" *Nano Letters*, **22**, 6375 (2022)
- 41) S.-H. Son, G. Park, J. Lim, C. Y. Son#, **S. S. Oh**, J. Y. Lee#, "Phase-separated organelle remodeling promotes selective partitioning of medicinal lipids in yeast", *Nature Communications*, **13**, 3612 (2022)
- 40) H. Yoo, J. Y. Lee, K. S. Park, **S. S. Oh**, "Lead-start isothermal polymerase amplification controlled by DNazymatic switches", *Nanoscale*, **14**, 7828 (2022)
- 39) S.-H. Son\*, J.-E. Kim\*, G. Park, Y.-J Ko, B. H. Sung, J. Seo, **S. S. Oh**, J. Y. Lee#, "Metabolite trafficking enables membrane-impermeable-terpene secretion by yeast", *Nature Communications*, **13**, 2605 (2022)
- 38) M. Saeidi, M. Lee, O. F. N. Okello, S.-Y. Choi, **S. S. Oh**, A. Simchi#, "Ultrafast graphitization and reduction of spongy graphene oxide by low-energy electromagnetic radiation to boost the performance and stability of carbon-based supercapacitors", *ACS Applied Energy Materials*, **5**, 367 (2022)
- 37) M. Han\*, J. Beon\*, J. Y. Lee, **S. S. Oh**, "Systematic combination of oligonucleotides and synthetic polymers for advanced therapeutic applications", *Macromolecular Research*, **29**, 665 (2021)
- 36) M.-A. Oh, C. I. Shin, M Kim, J. Kim, C. M Kang, S. H. Han, J.-Y. Sun, **S. S. Oh**, Y.-R. Kim, T. D. Chung, "Inverted Ion Current Rectification-based Chemical Delivery Probes for Stimulation of Neurons", *ACS Applied Materials Interfaces*, **13**, 26748 (2021)
- 35) J.-E. Kim, S.-H. Son, **S. S. Oh**, S. C. Kim, J. Y. Lee, "Pairing orthogonal chaperones with a cytochrome P450 for enhanced terpene synthesis in *Saccharomyces cerevisiae*", *Biotechnology Journal*, 2000452 (2021)
- 34) H. Yoo\*, J. S. Park\*, **S. S. Oh**, H. Kang#, "Osmotically balanced, large unilamellar liposomes that enable sustained bupivacaine release for prolonged pain relief in in vivo rat models", *Scientific Reports*, **11**, 12096 (2021)
- 33) G. Park, B. Kang, S. V. Park, D. Lee, **S. S. Oh**, "A Unified Computational View of DNA Duplex, Triplex, Quadruplex and Their Donor-Acceptor Interactions", *Nucleic Acids Research*, **49**, 4919 (2021)
- 32) H. Yoo\*, H. Jo\*, **S. S. Oh**, "Detection and beyond: Challenges and Advances in Aptamer-based Biosensors", *Materials Advances*, **1**, 2663 (2020)
- 31) N. Park, Y. T. Kim, Y. Park, J. Y. Cho, **S. S. Oh**, J. Heo, J. Son, "Voltage-triggered insulator-to-metal transition of ALD NbOx thin films for two-terminal threshold switch", *Journal of Materials Chemistry C*, **8**, 14365 (2020)
- 30) H.-R. Lee, Y. Lee, **S. S. Oh**, S. Q. Choi#, "Ultra-stable Freestanding Lipid Membrane Array: Direct Visualization of Dynamic Membrane Remodeling with Cholesterol Transport and Enzymatic Reactions", *Small*, **16**, 2002541 (2020)
- 29) B. S. Cha, E. S. Lee, S. Kim, J. M. Kim, S. H. Hwang, **S. S. Oh**, K. S. Park#, "Simple Colorimetric Detection of Organophosphorous Pesticides Using Naturally Occurring Extracellular Vesicles", *Microchemical Journal*, **158**, 105130 (2020)
- 28) S. -H. Son\*, J. -E. Kim\*, **S. S. Oh**, J. Y. Lee#, "Engineering Cell Wall Integrity Enables Enhanced Squalene Production in Yeast", *Journal of Agricultural and Food Chemistry*, **68**, 4922 (2020)

- 27) T. Walton, S. DasGupta, D. Duzdevich, **S. S. Oh**, J. W. Szostak, "In vitro selection of ribozyme ligases that use prebiotically plausible 2-aminoimidazole-activated substrates", *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, **117**, 5741 (2020)
- 26) S. V. Park\*, J. -S. Yang\*, H. Jo, B. Kang, **S. S. Oh**#, G. Y. Jung#, "Catalytic RNA, ribozyme, and its applications in synthetic biology", *Biotechnology Advances*, **37**, 107452 (2019)
- 25) B. Kang, S. V. Park, H. T. Soh, **S. S. Oh**, "A Dual-sensing DNA Nanostructure with an Ultra-broad Detection Range", *ACS Sensors*, **4**, 2802 (2019)
- 24) S. Kim, J. H. Kim, W. Y. Kwon, S. H. Hwang, B. S. Cha, J. M. Kim, **S. S. Oh**, K. S. Park, "Synthesis of DNA-templated Copper Nanoparticles with Enhanced Fluorescence Stability for Cellular Imaging", *Microchimica Acta*, **186**, 479 (2019)
- 23) W. Zhang, C. P. Tam, L. Zhou, **S. S. Oh**, J. Wang, J. W. Szostak, "Structural Rationale for the Enhanced Catalysis of Nonenzymatic RNA Primer Extension by a Downstream Oligonucleotide", *Journal of the American Chemical Society (JACS)*, **140**, 2829 (2018)
- 22) H. Kim, H. Jeong, S. Han, S. Beack, B. W. Hwang, M. Shin, **S. S. Oh**, S. K. Hahn, "Hyaluronate and Its Derivatives for Customized Biomedical Applications", *Biomaterials*, **123**, 155 (2017)
- 21) F. Fong\*, **S. S. Oh**\*, C. J. Hawker, H. Tom Soh, "In Vitro Selection of pH-activated DNA Nanostructures", *Angewandte Chemie International Edition*, **128**, 15484 (2016)
- 20) S. O. Poelma\*, **S. S. Oh**\*, S. Helmy, A. S. Knight, G. L. Burnett, H. T. Soh, C. J. Hawker, J. Read de Alaniz, "Controlled Drug Release to Cancer Cells from Modular One-photon Visible Light-responsive Micellar System", *Chemical Communications*, **52**, 10525 (2016)
- 19) H. Qu, A. Csordas, J. Wang, **S. S. Oh**, M. Eisenstein, H. T. Soh, "Rapid and Label-free Strategy to Isolate Aptamers for Metal Ions", *ACS Nano*, **10**, 7558 (2016)
- 18) N. Prywes, Y. S. Michaels, A. Pal, **S. S. Oh**, J. W. Szostak, "Thiolated Uridine Substrates and Templates Improve the Rate and Fidelity of Ribozyme-Catalyzed RNA Copying", *Chemical Communications*, **52**, 6529 (2016)
- 17) E. C. Izgu, **S. S. Oh**, J. W. Szostak, "Synthesis of Activated 3'-amino-3'-deoxy-2-thio-thymidine, a Superior Substrate for the Nonenzymatic Copying of Nucleic Acid Templates", *Chemical Communications*, **52**, 3684 (2016)
- 16) O. Jakobsson, **S. S. Oh**, M. Antfolk, M. Eisenstein, T. Laurell, H. T. Soh, "Thousand-fold Volumetric Concentration of Live Cells with a Recirculating Acoustofluidic Device", *Analytical Chemistry*, **87**, 8497 (2015)
- 15) M. Cho, **S. S. Oh**, J. Nie, R. Stewart, M. J. Radeke, M. Eisenstein, P. J. Coffey, J. A. Thomson, H. T. Soh, "Array-Based Discovery of Aptamer Pairs", *Analytical Chemistry*, **87**, 821 (2015)
- 14) **S. S. Oh**, B. F. Lee, F. A. Leibfarth, M. S. Eisenstein, M. J. Robb, N. A. Lynd, C. J. Hawker, H. T. Soh, "Synthetic Aptamer-Polymer Hybrid Constructs for Programmed Drug Delivery into Specific Target Cells", *Journal of the American Chemical Society (JACS)*, **136**, 15010 (2014)
- 13) K. Park, **S. S. Oh**, H. T. Soh, H. K. Park, "Target-Controlled Formation of Silver Nanoclusters in Abasic Site-Incorporated Duplex DNA for Label-Free Fluorescence Detection of Theophylline", *Nanoscale*, **6**, 9977 (2014)
- 12) **S. S. Oh**, K. Plakos, Y. Xiao, M. Eisenstein, H. T. Soh, "In Vitro Selection of Shape-Changing DNA Nanostructures Capable of Binding-Induced Cargo Release", *ACS Nano*, **7**, 9675 (2013)
- 11) M. Cho\*, **S. S. Oh**\*, J. Nie, R. Stewart, M. S. Eisenstein, J. Chambers, J. D. Marth, F. Walker, J. A. Thomson, H. T. Soh, "Quantitative Selection and Parallel Characterization of Aptamers", *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, **110**, 18460 (2013)
- 10) K. M. Ahmad, **S. S. Oh**, S. Kim, F. M. McClellan, Y. Xiao, H. T. Soh, "Probing the Limits of Aptamer Affinity with a Microfluidic SELEX Platform", *PLoS ONE*, **6**, e27051 (2011)
- 9) **S. S. Oh**, K. M. Ahmad, M. Cho, S. Kim, Y. Xiao, H. T. Soh, "Improving Aptamer Selection Efficiency through Volume Dilution, Concentration, and Continuous Washing in Microfluidic Channels", *Analytical Chemistry*, **83**, 6883 (2011)
- 8) J. Wang, Y. Liu, T. Teesalu, K. Sugahara, J. Adams, B. Ferguson, Q. Gong, **S. S. Oh**, A. Csordas, M. Cho, E. Ruoslahti, Y. Xiao, H. T. Soh, "Selection of Phage-Displayed Peptides on Live Adherent Cells in Microfluidic Channels", *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, **108**, 6909 (2011)
- 7) **S. S. Oh**, J. Qian, X. Lou, Y. Zhang, Y. Xiao, H. T. Soh, "Rapid Generation of Highly Specific Aptamers via Micromagnetic Selection", *Analytical Chemistry*, **83**, 1866 (2011)
- 6) M. Cho, Y. Xiao, J. Nie, R. Stewart, A. Csordas, **S. S. Oh**, J. A. Thomson, H. T. Soh, "Quantitative Selection of DNA Aptamers through Microfluidic Selection and High Throughput Sequencing", *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, **107**, 153733 (2010)

- 5) **S. S. Oh**, K. Plakos, X. Liu, Y. Xiao, H. T. Soh, “In Vitro Selection of Structure-Switching, Self-Reporting Aptamers”, *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, **107**, 14053 (2010)
- 4) A. Csordas, A. E. Gerdon, J. D. Adams, J. Qian, **S. S. Oh**, Y. Xiao, H. T. Soh, “Detection of Proteins in Serum via Micromagnetic Aptamer PCR (MAP) Technology”, *Angewandte Chemie International Edition*, **49**, 355 (2010)
- 3) A. E. Gerdon\*, **S. S. Oh\***, K. Hsieh, Y. Ke, H. Yan, H. T. Soh, “Controlled Delivery of DNA Origami on Patterned Surfaces”, *Small*, **5**, 1942 (2009)
- 2) **S. S. Oh**, D. H. Kim, M.-W. Moon, A. Vaziri, M. Kim, E. Yoon, K. H. Oh, J. W. Hutchinson, “Indium Nanowires Synthesized at Ultra-Fast Rate”, *Advanced Materials*, **20**, 1093 (2008)
- 1) **S. S. Oh**, D. H. Kim, S. H. Lee, H. J. Kim, H.-S. Chung, M. Kim, K. H. Oh, E. Yoon, “Ultra-Fast Growth of In Nanowires on In-Rich InGaN Layers by Focused Ion Beam Irradiation”, *Journal of Physics: Conference Series*, **61**, 884 (2007)

### Advisees

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- 우성욱(Sungwook Woo) – research professor
- 이현로(Hyun-ro Lee) – postdoc, **PIURI Fellow**
- Ewa Pietrasiak – postdoc
- 양운(Un Yang) – 7<sup>th</sup> year (MS-PhD Integrated Course)
- 강병화(Byunghwa Kang) – 7<sup>th</sup> year (MS-PhD Integrated Course), **Global PhD Fellow**
- 박규리(Gyuri Park) – 7<sup>th</sup> year (MS-PhD Integrated Course)
- 박소연(Soyeon Park) – 7<sup>th</sup> year (MS-PhD Integrated Course)
- 유혜빈(Hyebin Yoo) – 6<sup>th</sup> year (MS-PhD Integrated Course), **Global PhD Fellow**
- 이민중(Min Jong Lee) – 6<sup>th</sup> year (MS-PhD Integrated Course)
- 조혜성(Hyesung Jo) – 6<sup>th</sup> year (MS-PhD Integrated Course)
- 김진민(Jinmin Kim) – 5<sup>th</sup> year (MS-PhD Integrated Course)
- 한무현(Moohyun Han) – 3<sup>rd</sup> year (MS-PhD Integrated Course)
- 변지윤(Jiyun Beon) – 3<sup>rd</sup> year (MS-PhD Integrated Course)
- 천수민(Soomin Cheon) – 3<sup>rd</sup> year (MS-PhD Integrated Course)
- 문수영(Sooyoung Moon) – 2<sup>nd</sup> year (PhD Course)
- 정철영(Seolyeong Jeong) – 2<sup>nd</sup> year (MS-PhD Integrated Course)
- 국시현(Shihyun Kook) – 2<sup>nd</sup> year (MS-PhD Integrated Course)
- 김재문(Jaemoon Kim) – 2<sup>nd</sup> year (MS-PhD Integrated Course)
- 배다인(Dain Bae) – 1<sup>st</sup> year (MS-PhD Integrated Course), **Hyundai Motor Foundation Fellow**
- 안난영(Nanyeong An) – 1<sup>st</sup> year (MS-PhD Integrated Course)

### Alumni

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- 용문중(Moon-Jung Yong) – Samsung Electronics
- 김민우(Min Woo Kim) – Pohang Accelerator Laboratory (PAL)
- 손소희(So-Hee Son) – Korea Research Institute of Chemical Technology (KRICT)