Yang Sik Yun, Ph. D.

|  |  |
| --- | --- |
| Post-doctoral Fellow | Mobile Phone (U.S.): +1-217-200-5711 |
| Chemical and Biomolecular Engineering | Mobile Phone (South Korea): +82-10-2870-4354 |
| **University of Illinois at Urbana-Champaign** | E-mail: netiyys@illinois.edu |

**Education**

|  |  |
| --- | --- |
| **Doctor of Philosophy** | March, 2011 – February, 2017 School of Chemical and Biological Engineering, Seoul National UniversityThesis topic: Development of Oxydehydration Catalyst for Glycerol to Acrylic acid and Hydrogenation Catalyst of Carbon monoxide by Hetero-atom Doping TechniqueAdvisor: Prof. Jongheop Yi |
| **Bachelor of Science** | March, 2006 – February, 2011Department of Chemical and Biomolecular Engineering, Yonsei University |

**Research Experiences**

|  |  |
| --- | --- |
| **Research associate scholar****(Post-doctoral)** | March, 2017 – June, 2018Institute of Chemical Processes, School of Chemical and Biological Engineering,Seoul National UniversityAugust, 2018 – Present (Advisor: David W. Flaherty)Chemical and Biomolecular EngineeringUniversity of Illinois at Urbana-Champaign |

**Teaching Experiences**

|  |  |
| --- | --- |
| **Teaching Assistant** | September, 2011 – December. 2011 (Reaction Engineering II)September, 2012 – December, 2012 (Chemical and Biological Process Experiments)September, 2013 – December, 2013 (Chemical Industrial and Management Engineering)in School of Chemical and Biological Engineering, Seoul National University |

**Academic and Research Honors**

1. Academic Excellence Scholarship, Seoul National University (2012 1st / 2013 1st)
2. Academic Excellence Scholarship, Yonsei University (2007 2nd / 2009 1st)
3. Outstanding Poster Presentation Awards, *The Korean Society of Clean Technology (March, 2013)*
4. **National Science & Technology Scholarship** (Korea Student Aid Foundation) (2006 1st / 2006 2nd / 2007 1st / 2007 2nd / 2008 1st / 2008 2nd / 2009 1st / 2010 2nd)

**Publication Summary**

|  |  |  |
| --- | --- | --- |
| **Published Papers** | **Presentations** | **Patents** |
| **International** | **International** | **Domestic** | **Registered** | **Application** |
| **23**(**First author: 9**,Co-author 14) | 25 | 21 | **5** | **3**(US: 3) |

**List of Publications**

**[First Author]**

1. **Y. S. Yun**, C. E. Berdugo-Díaz, J. Luo, D. Barton, I. Chen, J. Lee, D. W. Flaherty, “The importance of Brønsted Acid Sites on C-O Bond Rupture Selectivities during Hydrogenation and Hydrogenolysis of Esters”, ***Journal of Catalysis***,**2022***,* 411,212-225.
2. **Y. S. Yun**, C. E. Berdugo-Díaz, and D. W. Flaherty, “[Advances in Understanding the Selective Hydrogenolysis of Biomass Derivatives](https://pubs.acs.org/doi/10.1021/acscatal.1c02866)”, ***ACS Catalysis*** **2021**, 11, 11193-11232.
3. **Y. S. Yun**†, M. Lee†, J. Sung, D. Yun, T. Y. Kim, H. Park, K. R. Lee, C. K. Song, Y. Kim, J. Lee, Y.-J. Seo, I. K. Song, and J. Yi\*, “Promoting effect of cerium on MoVTeNb mixed oxide catalyst for oxidative dehydrogenation of ethane to ethylene”, ***Applied Catalysis B: Environmetal,* 2018,** 237, 554-562. († these authors contributed equally)
4. **Y. S. Yun**†, H. Park†, D. Yun, C. K. Song, T. Y. Kim, K. R. Lee, Y. Kim, J. W. Han, and J. Yi\*, “Tuning the electronic state of metal/graphene catalysts for the control of catalytic activity via N- and B-doping into graphenes”, ***Chemical Communications,* 2018**, 54, 7147-7150. († these authors contributed equally)
5. **Y. S. Yun**, T. Y. Kim, D. Yun, K. R. Lee, J. W. Han\*, and J. Yi\*, "Understanding the reaction mechanism of glycerol hydrogenolysis over CuCr2O4 catalyst", ***ChemSusChem*** **2017**, 10, 442-454.
6. M. Lee†, **Y. S. Yun**†, J. Sung, J. Lee, Y-J. Seo, I. K. Song, and J. Yi “Enhanced ethylene productivity by the promotion of lattice oxygen in Ni-Nb-O/CexZr1-xO2 composite for oxidative dehydrogenation of ethane”, ***Catalysis Communications*** **2017**, 95, 58-62. († these authors contributed equally)
7. **Y. S. Yun**, K. R. Lee, H. Park, T. Y. Kim, D. Yun, J. W. Han, and J. Yi\*, “Rational Design of a Bi-functional Catalyst for the Oxydehydration of Glycerol: A Combined Theoretical and Experimental Study”, ***ACS Catalysis*** **2015**, 5, 82-94.
8. **Y. S. Yun**†, D. S. Park†, and J. Yi\*, "Effect of nickel on catalytic behaviour of bimetallic Cu-Ni catalyst supported on mesoporous alumina for the hydrogenolysis of glycerol to 1,2-propanediol", ***Catalysis Science & Technology*** **2014**, 4, 3191-3202.
9. Y. Choi†, **Y. S. Yun**†, H. Park, D. S. Park, D. Yun, and J. Yi\*, "A facile approach for the preparation of tunable acid nano-catalysts with a hierarchically mesoporous structure", ***Chemical Communications*** **2014**, 57(50), 7652-7655. († these authors contributed equally)

 **[Co-Author]**

1. C. E. Berdugo-Díaz, **Y. S. Yun**, M. Manetsch, Luo, D. Barton, I. Chen, D. W. Flaherty, “Pathways for Reactions of Esters with H2 over Supported Pd Catalysts: Elementary Steps, Site Requirements, and Particle Size Effects”,***ACS Catalysis***, **2022**, *In Revision.*
2. K. R. Lee, D. Yun, D. S. Park, **Y. S. Yun**, C. K. Song, Y. Kim, J. Park and Jongheop Yi\*, “In situ Manipulation of the d-band Center in Metals for Catalytic Activity in CO Oxidation, ***Chemical Communication***, **2021**, 57, 3403-3406
3. P. Priyadarshini, T. Ricciardulli, J. S. Adams, **Y. S. Yun**, D. W. Flaherty, “[Effects of Bromide Adsorption on the Direct Synthesis of H2O2 on Pd Nanoparticles: Formation Rates, Selectivities, and Apparent Barriers at Steady-State](https://www.sciencedirect.com/science/article/abs/pii/S0021951721001676)”, ***Journal of Catalysis****,* **2021**, *399*, 24-40*.*
4. Y. Kim, T. Y. Kim, C. K. Song, K. R. Lee, S. Bae, H. Park, D. Yun, **Y. S. Yun**, I. Nam, J. Park, H. Lee, and J. Yi\*, “Redox-driven restructuring of lithium molybdenum oxide nanoclusters boosts the selective oxidation of methane”, ***Nano Energy***, **2021**, 82, 105704
5. D.-J. Yoo, S. Yang, **Y. S. Yun**, J. H. Choi, D. Yoo, K. J. Kim,\* J. W. Choi\*, “[Tuning the Electron Density of Aromatic Solvent for Stable Solid-Electrolyte-Interphase Layer in Carbonate-based Lithium Metal Batteries](http://mest.snu.ac.kr/bbs/board.php?bo_table=sub4_1&wr_id=181)”, ***Advanced Energy Materials***, **2018**, 8, 1802365.
6. T. Y. Kim, C. K. Song, **Y. S. Yun**, D. Yun, J. W. Han, and J. Yi\*, “Active Site Structure of a Lithium Phosphate Catalyst for the isomerization of 2,3-epoxybutane to 3-buten-2-ol”, ***Molecular Catalysis*** **2018**, 445, 133-141.
7. D. Yun, D. S. Park, K. R. Lee, **Y. S. Yun**, T. Y. Kim, H. Park, H. Lee and J. Yi\*, “A New Energy-Saving Catalytic System: CO2 Activation via Metal/Carbon Catalyst”, ***ChemSusChem* 2017**, 10, 3671-3678.
8. D. Yun, **Y. S. Yun**, T. Y. Kim, H. Park, J. M. Lee, J. W. Han, and J. Yi\*, “Mechanistic Study of Glycerol Dehydration on Brønsted Acidic Amorphous Aluminosilicate”, ***Journal of Catalysis*** **2016**, 341, 33-43.
9. H. Park, **Y. S. Yun**, T. Y. Kim, K. R. Lee, J. Baek, J. Yi\*, "Kinetics of the dehydration of glycerol over acid catalysts with an investigation of deactivation mechanism by coke", ***Applied Catalysis B: Environmental*** **2015**, 176, 1-10.
10. Y. Choi, H. Park, **Y. S. Yun**, and J. Yi\*, "Effects of Pore Structures and Acid Properties on the Catalytic Dehydration of Glycerol", ***ChemSusChem*** **2015**, 8(6), 974-979.
11. T. Y. Kim, J. Baek, C. K. Song, **Y. S. Yun**, D. S. Park, W. Kim, J. W. Han, J. Yi\*, “Gas-phase Dehydration of Vicinal Diols to Epoxides: Dehydrative Epoxidation over a Cs/SiO2 Catalyst”, ***Journal of Catalysis*** **2015**, 323, 85-99.
12. D. Yun, T. Y. Kim, D. S. Park, **Y. S. Yun**, J. W. Han, J. Yi\*, “A Tailored Catalyst for the Sustainable Conversion of Glycerol to Acrolein: Mechanistic Aspect of Sequential Dehydration”, **ChemSusChem** **2014**, **7**(8), 2193-2201.
13. D. S. Park, D. Yun, T. Y. Kim, J. Baek, **Y. S. Yun**, J. Yi\*, “A Mesoporous Carbon-Supported Pt Nanocatalyst for the Conversion of Lignocellulose to Sugar Alcohols”, ***ChemSusChem*** **2013**, 6, 2281-2289.
14. J. R. Park, B. K. Kwak, D. S. Park, T. Y. Kim, **Y. S. Yun**, and J. Yi\*, "Effect of Acid Type in WOX clusters on The Esterification of Ethanol with Acetic Acid", ***Korean Journal of Chemical Engineering* 2012**, 29(12), 1695-1699.
15. B. K. Kwak, D. S. Park, **Y. S. Yun**, and J. Yi\*, "Preparation and characterization of nanocrystalline CuAl2O4 spinel catalysts by sol-gel method for the hydrogenolysis of glycerol", ***Catalysis Communications*** **2012**, 24, 90-95.

**[Patents]**

1. D. Flaherty, C. Berdugo-Diaz, **Y. S. Yun**, J. Lee, J. Luo, X. Chen, D. Barton, “Heterogeneous catalyst comprising a transition metal on a zeolite carrier and the use of such catalyst in a process for producing an ether”, US 63/276,311 (patent application).
2. D. Flaherty, C. Berdugo-Diaz, **Y. S. Yun**, J. Luo, X. Chen, D. Barton, “Heterogeneous catalyst comprising a sulfonic acid functionalized SiO2 carrier and the use of such catalyst in a process for producing an ether”, US 63/276,308 (patent application).
3. D. Flaherty, J. Luo, X. Chen, D. G. Barton, C. Berdugo-Diaz, **Y. S. Yun**, “Processes for Producing an Ether”, US 63/107,739 (patent application).
4. M. Lee, J. W. Lee, M. H. Ki, Y. J. Seo, J. Yi, **Y. S. Yun**, I. K. Song, “Catalyst system for oxidative dehydrogenation of ethane, preparation method thereof, and preparation method of ethylene from ethane by using the catalyst system”, KR 10-2312033
5. M. Lee, J. W. Lee, M. H. Ki, Y. J. Seo, J. Yi, **Y. S. Yun**, I. K. Song, “Catalyst system for oxidative dehydrogenation of ethane, preparation method thereof, and preparation method of ethylene from ethane by using the catalyst system”, KR 10-2303012.
6. J. Yi, D. S. Park, D. Yun, **Y. S. Yun**, H. Park, “Carbon catalyst having open pore in which dispersed metal and method for producing sorbitol using the same”, KR 10-1535123.
7. J. Yi, Y. Choi, H. Park, **Y. S. Yun**, “Acidic Oxide Nanoparticles having 3-Dimensional Open Pores, Method for Preparing the Same and Method for Producing Acrolein or Acrylic Acid from Glycerol Using the Same”, KR 10-1504673.
8. J. Yi, Y. Choi, **Y. S. Yun**, H. Park, D. Yun, “Aluminosilicate Nano-spheres having 3-Dimensional Open Pores, Method for Preparing the Same and Method for Producing Acrylic Acid from Glycerol Using the Same”, KR 10-1337301.

**[Selected International Presentations]**

1. **Y. S. Yun**, C. E. Berdugo-Diaz, J. Luo, D. G. Barton, I. Chen, J. Lee, and D. W. Flaherty, “Direct Reduction of Esters to Ethers Using H2 over Supported Pd Catalysts: Importance of Brønsted Acid Sites on Ether Formation”, 27th North American Catalysis Society Meeting, New York Hilton Midtown, New York, New York, USA, May. 22-27, 2022.
2. **Y. S. Yun**, C. E. Berdugo-Diaz, J. Luo, D. G. Barton, I. Chen, J. Lee, and D. W. Flaherty, “Direct Formation of Ether by Reduction of Esters on Pd supported Catalysts in Liquid-phase Using Molecular H2: Support effects, Sites Requirements, and Reaction mechanism” ACS National Meeting – Spring, USA, April 5-16, 2021.
3. **Y. S. Yun**, D. Yun, J. Yi, “Developments of efficient catalysts for glycerol conversion to value-added chemicals via hydrogenolysis, dehydration, and oxidehydration, and characterizations combined with experiments and DFT calculations” The Catalysis Club of Chicago – Spring symposium, Chicago, USA, August, 27, 2020.
4. **Y. S. Yun**, D. Yun, T. Y. Kim, K. R. Lee, J. W. Han, and J. Yi, “Mechanism of glycerol hydrogenolysis to 1,2-propanediol over Cu(111) and CuCr2O4(100)”, 16th Korea-Japan Symposium on Catalysis & 3rd International Symposium of Institute for Catalysis, KADERU 2-7, Sapporo, Hokkaido, Japan, May. 15-17, 2017.
5. **Y. S. Yun**, M. Lee, J. Sung, J. Lee, Y.-J. Seo, I. K. Song, and J. Yi, “Enhanced Redox Property in Ni-Nb-O/CexZr1-xO2 for Selective Production of Ethylene from Ethane”, 16thKorea-Japan Symposium on Catalysis & 3rd International Symposium of Institute for Catalysis, KADERU 2-7, Sapporo, Hokkaido, Japan, May. 15-17, 2017.
6. H. Park, **Y. S. Yun**, D. Yun, T. Y. Kim, K. R. Lee, J. Baek, M. Lee, and J. Yi, “An investigation of deactivation mechanism by coke via kinetics study of the glycerol dehydration over acid catalysts”, 16th International Congress on Catalysis, CNCC, Beijing, China, July. 3-8, 2016.
7. **Y. S. Yun**, K. R. Lee, H. Park, T. Y. Kim, D. Yun, J. W. Han, and J. Yi, “Bi-Functional Mo-V-W-O Catalysts for the One-Step Production of Acrylic Acid from Glycerol and Validation Via First Principle Calculations”, 24th North American Catalysis Society Meeting, David L. Lawrence Convetion Center, Pittsburgh, Pennsylvania, USA, June. 14-19, 2015.
8. **Y. S. Yun**, T. Y. Kim, D. Yun, H. Park, J. M. Lee, J. W. Han, and J. Yi, “Mechanistic insight of hydrogenolysis of glycerol over Cu-based catalysts via ab initio calculations”, The 15th Korea-Japan Symposium on Catalysis, BEXCO and Haeundae Centum Hotel, Busan, Korea, May. 26-28, 2015.
9. **Y. S. Yun**, Y. Choi, H. Park, D. Yun, D. S. Park, and J. Yi, “Preparation of 3D Open-Porous Acidic Heterogeneous Catalysts for the Chemical Production”, 2013 MRS Fall Meeting Program & Exhibit, Boston, Massachusetts, USA, Dec. 1-6, 2013.
10. **Y. S. Yun**, Y. Choi, H. Park, D. Yun, and J. Yi, “Three dimensionally open porous acid catalysts with adjustable acidic properties”, The 14th Japan-Korea Symposium on Catalysis, WINC Aichi, Nagoya, Japan, July 1-3, 2013.

**Technical Skills**

1. **Synthesis of Catalyst**
	1. Nanostructured catalysts (Polyoxometalate, sol-gel, hydrothermal, hard- and soft-templating method, and so on)
		1. 3D open porous aluminosilicate and aluminosilicophosphate nanospheres
		2. Mesoporous alumina
		3. Metal nanoparticles
		4. Molybdenum-vanadium-tellurium-niobium mixed oxide catalyst
	2. Supported catalysts (Colloidal method, Impregnation, precipitation, direct reduction method, and so on)
		1. Bimetallic Cu-Ni/mesoporous alumina
		2. Metal/graphene, and metal/doped graphene
		3. Metal oxide and metal nanoparticles on alumina, silica, and titania
		4. Metal-zeolites
	3. Hetero-atom doped catalysts (Hydrothermal, heat-treatment method, and so on)
		1. Nitrogen or Boron doped graphene
		2. Tungsten or cerium doped molybdenum-vanadium based mixed oxide
2. **Characterization Techniques**
	1. Qualification and quantification of chemicals
		1. Gas chromatography (w/ frame ionization detector (FID), thermal conductivity detector (TCD), and mass spectrometer detector (MSD))
		2. Liquid chromatography (w/ refractive index detector (RID) and ultraviolet detector (UVD)).
	2. Experiences for handling material analysis instruments
		1. *In-situ* Fourier transform infrared spectroscopy (Transmission FT-IR, ATR-FT-IR)
		2. Temperature programmed techniques w/ TCD and MSD: Oxidation (TPO), reduction (TPR), desorption (TPD)
		3. TEM: JEM-3010 (JEOL)
		4. XRD: D/max-2500/PC (Rigaku)
		5. UV-Visible-NIR spectroscopy
		6. XAS (Pohang accelerator laboratory)
		7. Scanning electron microscopy (SEM)
		8. Transmission electron microscopy (TEM)
	3. Utilized instruments
		1. X-ray photoelectron spectroscopy (XPS)
		2. Scanning transmission electron microscopy (STEM)
		3. Electron paramagnetic resonance spectroscopy (EPR)
		4. Nuclear magnetic resonance spectroscopy (NMR)
		5. Thermogravimetric analysis (TGA)
		6. Inductively coupled plasma-mass spectrometer (ICP-MS)
		7. Electron probe micro-analyzer (EPMA)
3. **Computational Chemistry**
	1. Periodic DFT calculations using Vienna ab-initio software package (VASP)
		1. Modeling of amorphous molybdenum-vanadium-oxide, tungsten incorporated molybdenum-vanadium-oxide models.
		2. Modeling of crystalline metal (Cu, Pd, etc.), metal oxide (Mo-V-based mixed oxide), and supported surfaces.
		3. Transition states for chemical reactions: Dehydration, dehydrogenation, migration and so on
	2. Cluster DFT calculations using Gaussian 03 program
		1. Determination of entropy for gaseous molecules
4. **Reactor Design and Operation**
	1. Fully automated high-pressured fixed-bed flow reactor with online sampling of liquid and gas products for ester reduction to ether
	2. High-pressure batch reactor for hydrogenolysis reaction
	3. Fixed-bed flow reactor w/ condensing, trapping, and online sampling for dehydration, oxydehydration, cracking, oxidative dehydrogenation, CO hydrogenation, and selective hydrogenation.