

Yang Sik Yun, Ph. D.

Post-doctoral Fellow
School of Chemical and Biological Engineering
Seoul National University

Office Phone: +82-2-880-7417
Mobile Phone: +82-10-2870-4354
E-mail: netiyys@snu.ac.kr

Education

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

Research Experiences

- Research associate scholar** March, 2017 – June, 2018z
(Post-doctoral) Institute of Chemical Processes, School of Chemical and Biological Engineering, Seoul National University
August, 2018 – Present (Advisor: David W. Flaherty)
Chemical and Biomolecular Engineering
University 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	Domestic	Registered	Application
17 (First author: 7, Co-author 10)	20	21	3	2

List of Publications

[First Author]

1. **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 MoVTaNb mixed oxide catalyst for oxidative dehydrogenation of ethane to ethylene", *Applied Catalysis B: Environmental*, **2018**, 237, 554-562. († these authors contributed equally)
2. **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)
3. **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.
4. 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/Ce_xZr_{1-x}O₂ composite for oxidative dehydrogenation of ethane", *Catalysis Communications* **2017**, 95, 58-62. († these authors contributed equally)
5. **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.
6. **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.
7. 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. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. J. R. Park, B. K. Kwak, D. S. Park, T. Y. Kim, **Y. S. Yun**, and J. Yi*, "Effect of Acid Type in WO_x clusters on The Esterification of Ethanol with Acetic Acid", *Korean Journal of Chemical Engineering* **2012**, 29(12), 1695-1699.
10. 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. 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.
2. 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.
3. 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.
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 10-2017-0162597 (patent application).
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 10-2017-0162598 (patent application).

[Selected International Presentations]

1. **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 $\text{CuCr}_2\text{O}_4(100)$ ”, 16th Korea-Japan Symposium on Catalysis & 3rd International Symposium of Institute for Catalysis, KADERU 2-7, Sapporo, Hokkaido, Japan, May. 15-17, 2017.
2. **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/ $\text{Ce}_x\text{Zr}_{1-x}\text{O}_2$ for Selective Production of Ethylene from Ethane”, 16th Korea-Japan Symposium on Catalysis & 3rd International Symposium of Institute for Catalysis, KADERU 2-7, Sapporo, Hokkaido, Japan, May. 15-17, 2017.
3. 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.
4. **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 Convention Center, Pittsburgh, Pennsylvania, USA, June. 14-19, 2015.
5. **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.
6. **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.
7. **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

- A. Nanostructured catalysts (Polyoxometalate, sol-gel, hydrothermal, hard- and soft-templating method, and so on)
 - i. 3D open porous aluminosilicate and aluminosilicophosphate nanospheres
 - ii. Mesoporous alumina
 - iii. Metal nanoparticles
 - iv. Molybdenum-vanadium-tellurium-niobium mixed oxide catalyst
- B. Supported catalysts (Impregnation, precipitation, direct reduction method, and so on)
 - i. Bimetallic Cu-Ni/mesoporous alumina
 - ii. Metal/graphene, and metal/doped graphene
 - iii. Metal oxide and metal nanoparticles on alumina, silica, and titania
- C. Hetero-atom doped catalysts (Hydrothermal, heat-treatment method, and so on)
 - i. Nitrogen or Boron doped graphene
 - ii. Tungsten or cerium doped molybdenum-vanadium based mixed oxide

2. Characterization Techniques

- A. Qualification and quantification of chemicals
 - i. Gas chromatography (w/ flame ionization detector (FID), thermal conductivity detector (TCD), and mass spectrometer detector (MSD))
 - ii. Liquid chromatography (w/ refractive index detector (RID) and ultraviolet detector (UVD)).
- B. Experiences for handling material analysis instruments
 - i. In-situ Fourier transform infrared spectroscopy (FT-IR)
 - ii. Temperature programmed techniques w/ TCD and MSD: Oxidation (TPO), reduction (TPR), desorption (TPD)
 - iii. TEM: JEM-3010 (JEOL)
 - iv. XRD: D/max-2500/PC (Rigaku)
 - v. UV-Visible-NIR spectroscopy
 - vi. XAS (Pohang accelerator laboratory)
 - vii. Scanning electron microscopy (SEM)
 - viii. Transmission electron microscopy (TEM)
- C. Utilized instruments
 - i. X-ray photoelectron spectroscopy (XPS)
 - ii. Scanning transmission electron microscopy (STEM)
 - iii. Electron paramagnetic resonance spectroscopy (EPR)
 - iv. Nuclear magnetic resonance spectroscopy (NMR)
 - v. Thermogravimetric analysis (TGA)
 - vi. Inductively coupled plasma-mass spectrometer (ICP-MS)
 - vii. Electron probe micro-analyzer (EPMA)

3. Computational Chemistry

- A. Periodic DFT calculations using Vienna ab-initio software package (VASP)
 - i. Modeling of amorphous molybdenum-vanadium-oxide, tungsten incorporated molybdenum-vanadium-oxide models.
 - ii. Modeling of crystalline metal (Cu, Pd, etc.), metal oxide (Mo-V-based mixed oxide), and supported surfaces.

iii. Transition states for chemical reactions: Dehydration, dehydrogenation, migration and so on

B. Cluster DFT calculations using Gaussian 03 program

i. Determination of entropy for gaseous molecules

4. **Reactor Design and Operation**

A. High-pressure batch reactor for hydrogenolysis reaction

B. Fixed-bed flow reactor w/ condensing, trapping, and online sampling for dehydration, oxydehydration, cracking, oxidative dehydrogenation, and selective hydrogenation.

C. High-pressured continuous flow reactor for esterification