Prof. Sangho Koo

Objectives: Empowering the youth with dreams and hope through education, and Creating values for the world through research – that is my ultimate mission

Affiliation:

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Education

1981.03~1985.02:	**BS**, Seoul National University, Chemistry Major
1986.01~1987.05:	**MS**, The University of Michigan, Organic Chemistry
1987.11~1988.05:	Military Service Break (retired as a Second Lieutenant)
1988.09~1992.08:	**Ph. D.** The University of Michigan, Organic Chemistry
1992.09~1994.02:	**Postdoctoral Fellow**, Emory University

Professional Career

1994.03~present:	Professor in Chemistry, *Myongji University*
2006.02~present:	Special Visiting Professor, Chemical Biotechnology, School of Pharmacy, *East China University of Science and Technology*, Shanghai, China
2013.03~present:	Professor in Energy Science and Technology, *Myongji University*
2017.02~2021.01:	Dean of Natural Science, *Myongji University*
2018.01~2019.12:	IUPAC Division VIII (Nomenclature Committee) member National Representative (NR) for Korea
2019.01~present:	Associate Editor, *Journal of the Korean Chemical Society*
2019.09~present:	Guest Professor, Institute of Traditional Chinese Medicine, *Tianjin University of Traditional Chinese Medicine,* Tianjin, China
2020.01~2022.12:	Reginal Chairman of Korean Chemical Society (Gyeonggi Province).
2021.01~present:	Editorial Board, Acupuncture and Herbal Medicine, by Wolters Kluwer

Awards

2021.02	Academic Excellence Award, Korean Chemical Society (Organic)
2022.08	Academic Excellence Award, Myongji University
2023.07	International Carotenoid Society Fellow

Research Areas

1. **Advancement in Cyclization Methods**: We have successfully devised efficient synthetic routes for the formation of five-, six-, and seven-membered rings. Additionally, we have explored the synthesis of polycyclic structures utilizing these compounds. Our current focus is on the development of Mn(III)-catalyzed oxidative hetero-aromatic cyclization, aiming for the synthesis of furan, pyrrole, indole, piperazinones, and oxadiazoles.

2. **Exploring the Chemistry of Isoprenoids:** Isoprenoids encompass terpenoids, carotenoids, and steroids. Our research focuses on the development of versatile bi-functionalized C_5 prenyl building blocks, strategically employed in chain-extension processes for synthesizing diverse isoprenoid natural products. Utilizing the Julia Sulfone protocol for C–C bond formation, we can selectively produce polyprenyl or polyene structures, depending on the sulfone elimination pathway. Our innovative approach involves the assembly of carotenoid natural products using C_{10} bis(chloroallylic) sulfide, C_{10} dialdehyde, and C_{20} diphosphonate. We've successfully extended this methodology to craft various important carotenoids. Furthermore, our efforts extend to the synthesis of terpenoids and steroids, employing a combination of cyclization and chain-extension strategies. Notable carotenoid compounds synthesized thus far include Vitamin A, Vitamin K, Tretinoin, Isotretinoin, Toco-retinoate, β-carotene, ε-carotene, Lycopene, Lycophyll, Nor-Bixin, Crocetin, Zeaxanthin, Iso-Zeaxanthin, Astaxanthin, Canthaxanthin, Lutein, Coenzyme Q-10, and Abscisic acid.

3. **Advancing Organic Molecular Wires:** Drawing on our proficiency in carotenoid synthesis, we have effectively designed conjugated polyene chains with adjustable lengths. These electron-conducting chains are enhanced by the integration of phenyl substituents, which not only stabilize the chains but also regulate their conductance. Presently, we are actively developing a range of organic conducting wires with diverse resistances. Our ongoing endeavors encompass the construction of varied molecular electronic circuits, each exhibiting unique conductance properties.

4. **Biomass Conversion:** Our research focuses on developing efficient methods for converting monomeric sugars into valuable platform chemicals, specifically targeting 5-hydroxymethylfurfural (5-HMF) and 5-hydroxymethylpyrrole-2-carbaldehydes (pyrralines). We employed a bis(sulfonic acid)-ionic liquid for fructose conversion to 5-HMF, while optimizing conditions with DMSO and oxalic acid successfully transformed glucose (or ribose) and primary amines (or amino acids) into pyrralines. This one-pot conversion of sugars into pyrralines has been applied to the total synthesis of biologically active natural products, including (–)-Hanishin, Lobechine, and Magnolamide. Ongoing efforts in biomass conversion focus on ribose, aiming to produce sustainable platform chemicals as intermediates for new drug synthesis.

Recent Paper List (2020 ~ 2025)

1. "Synthesis and application of novel hydroxylated thia-crown ethers as composite ionophores for selective recovery of Ag+ from aqueous sources" H. T. Fissaha, G. M. Nisola, F. K. Burnea, J. Y. Lee, S. Koo, S.-P. Lee, H. Kim, W.-J. Chung* *Journal of Industrial and Engineering Chemistry* **2020**, *81*, 415-426 (2020.01.25.).
2. "Synthetic strategy for tetraphenyl-substituted all-*E*-carotenoids with improved molecular properties" B. Lim, H. Jung, H. Yoo, M. Park, H. Yang, W.-J. Chung, S. Koo* *European Journal of Organic Chemistry* **2020**, (11), 1769-1777 (2020.03.16.).
3. "Crown ethers "clicked" on fibrous polyglycidyl methacrylate for selective Li+ retrieval from aqueous sources" G. M. Nisola, K. J. Parohinoga, R. E. C. Torrejos, S. Koo, S.-P. Lee,* H. Kim,* W.-J. Chung,* *Colloids and Surfaces A* **2020**, *595*, 124709 (2020.04).
4. "Concise and practical synthesis of (+)-Abscisic acid" D. Kim and S. Koo* *ACS Omega* **2020**, 5(22), 13296-13302. (2020.05).
5. "Syntheses of Chalcone-Derived Heteroaromatics with Anti-bacterial Activities" H. Jin, X. Jiang, H. Yoo, T. Wang, C. G. Sung, U. Choi, C.-R. Lee,* H. Yu, S. Koo* *ChemistrySelect* **2020**, *5*(40), 12421-12424. (online Oct. 29, 2020).
6. "Tuning Single-Molecule Conductance by Controlled Electric Field-Induced *trans*-to-*cis* Isomerisation" C.S. Quintans, D. Andrienko, K.F. Domke, D. Aravena, S. Koo, I. Díez-Pérez, A.C. Aragonès, *Applied Sciences* **2021**, *11*(8), 3317. (online Apr. 7, 2021).
7. "Apocarotenals of phenolic carotenoids for superior antioxidant activities" Gaosheng Shi, Lina Gu, Hyunuk Jung, Wook-Jin Chung, Sangho Koo,* *ACS Omega* **2021**, *6*, 25096-25108. DOI: org/10.1021/acsomega.1c04432 (2021.9.16.).
8. "Furan Oxidation by Mn(III)/Co(II) catalysts–Application to Benzofuran Synthesis" Tingshu Wang, Miao Zhang, Yifan Zheng, Junmo Seong, Myoung Soo Lah, Sangho Koo,* *RSC Advances* **2021**, *11*, 31395-31399. DOI: 10.1039/d1ra05305a (2021.09.22).
9. "Ribose conversion with amino acids into pyrraline platform chemicals - expeditious synthesis of diverse pyrrole-fused alkaloid compounds" Soohyeon Cho, Lina Gu, Ik Joon In, Bo Wu, Taehoon Lee, Hakwoon Kim, Sangho Koo,* *RSC Advances* **2021**, *11*, 31511-31525. DOI: 10.1039/d1ra06110k (2021.09.23).
10. "Multidentate thia-crown ethers as hyper-crosslinked macroporous adsorbent resins for the efficient Pd/Pt recovery and separation from highly acidic spent automotive catalyst leachate" R. E. C. Torrejos, E. C. Escobar, J. W. Han, S. H. Min, H. Yook, K. J. Parohinog, S. Koo, H. Kim, G.

M. Nisola, W.-J. Chung, *Chemical Engineering Journal* **2021**, *424*, 130379 (2021.11.15).

11. "Cyclin-dependent kinase 1 as a potential target for lycorine against hepatocellular carcinoma" Shuangshuang Yin, Shenshen Yang, Yanming Luo, Jia Lu, Gaoyong Hu, Kailong Wang, Yingying Shao, Shiyue Zhou, Sangho Koo, Yuling Qiu, Tao Wang, Haiyang Yu, *Biochemical Pharmacology* **2021**, *193*, 114806 (2021.11).
12. "13,13′-Diphenalkyl β-carotenes as pi-stacking models of chlorophylls and carotenoids in photosynthesis" Boram Lim, Young-Hun Kim, Hyein Kim, Myeongnam Park, Huisu Yeo, Sangho Koo,* *Bulletin of the Korean Chemical Society* **2022**, *43(8)*, 1037-1039 (2022.08.30).
13. "Oxo-carotenoids as Efficient Superoxide Radical Scavengers" Gaosheng Shi, Hyein Kim, Sangho Koo,* *Antioxidants* **2022**, *11*, 1525 (2022.08.05).
14. "Expeditious synthesis of fluorescent bis(phenylfuryl)benzenes" Miao Zhang, Tingshu Wang, Chanyoung Boo, Sangho Koo,* *Synthesis* **2023**, *55*, 111-120 (2023.1.10); DOI: 10.1055/a-2055-7678).
15. "Photoinduced dynamics of 13,13'-diphenylpropyl-ß-carotene" Sangho Koo, Yeong Hun Kim, Oliver Flender, Mirko Scholz, Kawon Oum, Thomas Lenzer,* *Molecules* **2023**, *28(8)*, 3505 (DOI: 10.3390/molecules28083505).
16. "Rapid assembly of pyrrole-ligated 1,3,4-oxadiazoles and excellent antibacterial activity by iodophenol substituents" Hyein Kim, Lina Gu, Huisu Yeo, Umji Choi, Chang-Ro Lee, Haiyang Yu, Sangho Koo,* *Molecules* **2023**, *28(8)*, 3638 (DOI: 10.3390/molecules28083638).
17. "Preparation of Divergent Intermediates and Convergent Synthesis of Phytofluene" Chanyoung Boo, Hyein Kim, Huijeong Yang, Seunghyo Han, Huisu Yeo, Chibeom Seo, Sangho Koo,* *Synthesis* **2023**, *55*(16), 2517-2525 (DOI:10.1055/a-2055-7678).
18. "Drug co-administration in the tumor immune microenvironment of Hepatocellular carcinoma" Yingying Shao, Ranran Su, Yu Wang, Shuangshuang Yin, Weiling Pu, Sangho Koo, Haiyang Yu, *Acupuncture and Herbal Medicine* **2023**, *3*, 189-199.
19. "Palladium-Catalyzed *S*-Allylation of Vinyl Carbinols – Total Syntheses of Carotenoids by Julia-Kocienski Olefination" Aleksei N. Golikov, Chibeom Seo, JaeHwan Lee, and Sangho Koo,* *Advanced Synthesis & Catalysis* **2024**, *366*(1), 82-90. (published online 2023.11.07) (DOI 10.1002/adsc.202301055).
20. "Regioselective De Novo Synthesis of Phenolic Isoprenoids Grifolin and Neogrifolin" Boram Lim, Huisu Yeo, Seunghyo Han, Dabin Kim, Hansuk Lee, Sangho Koo, *Applied Sciences* **2025**, 15(3), 1438; (published online 02.02.2025) DOI 10.3390/app15031438).

21. “Diglycerides of Natural Phenols and Organic Acids afor Enhanced Biological Activities” Jisu Hong, Seunghyo Han, Huisu Yeo, Chanyoung Boo, Hyein Kim, Eunbi Kim, Boram Lim, Yeon Jeong Jo, Ji-Seon Hyun, Nam Ho Lee, Sangho Koo, *Asian Journal of Organic Chemistry* **2025**. (published online May 21, 2025) DOI: 10.1002/ajoc.202500285.
22. “All-*E*-Carotenoid Synthesis via Suzuki Coupling of α,ω-Dibromopentaene: HPLC Optimization of the Catalyst Conditions” Yang Liu, Aleksei, N. Golikov, Hansuk Lee, and Sangho Koo, *Journal of Organic Chemistry*, **2025**, *90*. (online published 08.03.2025) DOI: 10.1021/acs.joc.5c01034 ***Selected as a Cover Article.***

34 Korean patents and 16 International patents registered. Four of them were licensed to Company.

Seminar Title:

Transformation of natural products into versatile chemicals to improve their physiological activity.