Yucheng Yang (Jeremy Young)

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EDUCATION

Columbia University New York, NY
Master of Science - Chemical Engineering *09/2022-12/2023 (Expected)*
Core Courses: *Adv.Kenetics, Thermodynamics, Transport in Fluid Mixture, Math Methods in ChemE, Essentials of ChemE A&B, Principle of Genomic Tech, Atomistic Simulation, Electrochem Matls&Devs, Process Safety*

Southeast University Nanjing, CN
Bachelor of Science - Chemistry *09/2018-06/2022*
Core Courses: *Phys Chem, Inorg Chem, Analy Chem, Org Chem, Structural Chem, Instrumental&Spectral Analysis, Phys Org Chem, Intermediate Inorg Chem, Polymer Chem, Biochemistry, Electrochemistry, Principle of ChemE*

PUBLICATIONS AND PRESENTATIONS

L.Tian, ...**Y.Yang** & Yuan Yang*. Designing Electrolytes with High Solubility of Sulfides and Disulfides for K-Na/S Batteries with High Energy Density and Low Cost. *Nat.Sustainability.* (Under Review).
Y.Wu§, **Y.Yang§** & Z.Ke*. Template-Induced Synthesis of 3D Curved Graphdiyne Membranes on Copper Foam. *Chemistry of Materials.* (Under review).
Y.Wu, **Y.Yang** & Z.Ke*. *ACS Appl. Mater. Interfaces.* 2023, 15, 34, 40933–40941.
J.Zhang, **Y.Yang** & H.Zhu*. *Guangzhou Chemical Industry*. 2022, 50 (18): 92-93, 131. (In Chinese).
Y.Yang. *The 10th Undergraduate Symposium of Southeast University.* May 2021, Excellent Report.
Y.Yang*. *ESCC'21: The 2nd European Symposium on Computer and Communications.* April 2021, 42-48.

EXPERIENCE

Application of MOF, Graphene and Glass Electrodes in BioMEMS and Biosensor New York, NY
RA, Supervisor: Prof. Qiao Lin, Columbia University *09/2022-Present*

- Synthesizd $Ni_3(HITP)_2$ MOF particles and seperated with 5% nafion in water. Dropped and heated the liquild on SiO_2 substrate to make a MOF film with great electricity conductivity, achieved convenient and rapid preparation of MOF electrodes for biosensor. Characterized it with XRD and SEM.
- Attached graphene on SiO_2 substrate and characterized with SEM. Built tacrolimus aptamer on graphene to develop a sensor for sensitive detection of tacrolimus (cooperate with Columbia Medicine Department).
- Attached TNF-a aptamer on $Ni_3(HITP)_2$ MOF and graphene to test TNF-a sensor's shelf-life, found the low shelf-life (4 cycles) is due to the detachment and degradation of aptamer. Used GA Coupling to build fluorescent TNF-a aptamer on glass beads to achieve a long-term (9 cycles) fluorescence detection of TNF-a.
- Synthesized ZIF-90 MOF on SiO_2 substrate and functionlized it with csulfonate group to improve its conductivity for a sensor. Attached TNF-a aptamer on functionalized ZIF-90 covalently to improve shelf-life.

2D-COF Films Inhibits Li Dendrites on Copper Collector for Anode-free Li Batteries New York, NY
RA, Supervisor: Prof. Yuan Yang, Columbia University *01/2023-Present*

- Synthesized TAPB-PDA and Tp-Tta COF film (self-assembly) on Cu foil (CF). Characterized with SEM, XRD, FIB, etc. Tested the mechanical property and chemical stability of the two COFs in electrolyte and chose CF with TAPB-PDA COF as current collector to manufacture the anode-free pouch cell.
- Adjusted morphology and thickness of COF film on CF with different reaction time and condition. Found 16h COF(0.7um) significantly increased the shelf-life of battery with essentially no reduction in work efficiency in 10g/Ah electrolyte. The mechanism is COF film allows Li^+ to pass through it selectively with its pore size(1.4nm) and inhibits the Li dendrite grow on the Cu through its mechanical strength.
- Used 5wt% TMP-TMA polymer to solidify/lock the LiDFOB/$LiBF_4$ (in FEC-DEC) dual-salt electrolyte to improve its resistance of puncture of Li dendrite to increase durability and safety of battery. Wet COF pore with electrolyte to avoid polymer blockage (which prevent Li^+ to pass through and increase cell polarization).

Application of Metal-Organic Frameworks in Catalyzing Organic Reactions Shenzhen, CN
RA, Supervisor: Prof. Zhihai Ke, The Chinese University of Hong Kong, Shenzhen *06/2021-09/2021*

- Prepared graphdiyne film (GDY) through Glaser-Hay Coupling with Me_3Si-C≡CH, ZnCl and n-BuLi, purified the medium (HEB-TMS) by column chromatography. Growed GDY on copper foam (CF) substrate, loaded Cu-MOF (HKUST-1) on GDY-CF through self-assembly, added polymer membrane on HKUST-1-GDY-CF to prepare catalyst HKUST-1-GDY-CF-P for improving water-phase catalysis effect.
- Compared catalytic of HKUST-1-GDY-CF-P, GDY-CF-P, HKUST-1-CF-P and HKUST-1-CF on H_2O_2 oxidizing phenol to verify the catalysis-enhancement mechanism is GDY promotes electronic transfer and polymer enhances stability in aqueous catalysis.
- Catalyzed the reaction of NBS oxidizing benzyl alcohol and ring-opening reaction of ethylene oxide with HKUST-1-GDY-CF, achieved a yield of >95%.

INDEPENDENT PROJECTS

Study on the Synthesis and Reactivity of N-, O- Substituted Silylene Nanjing, CN

Graduation Dissertation (Excellent,10%), Supervisor: Prof. Hao Wang, Southeast University *02/2022-06/2022*

- Applied n-BuLi and $NH(SiMe_3)_2$ to get $LiN(SiMe_3)_2$ and reacted it with 2,6-$(tBu)_2$ArOH to prepare 2,6-$(tBu)_2$ArOLi (DBP Li-salt). Uesd C=$(NtBu)_2$ and PhLi to get RLi (R:PhC$(NtBu)_2$), synthesized $RSiHCl_2$ with RLi and $SiHCl_3$, removed LiCl and $NH(TMS)_2$ by $LiN(TMS)_2$ in toluene to obtain RSiCl. Synthesized new and stable silylene 2,6-$(tBu)_2$ArO-Si-R with RSiCl and DBP Li-salt. Characterized with XRD and NMR.
- Reacted 2,6-$(tBu)_2$ArO-Si-R(LSiR) with O-$N(CH_3)_3$, PhC≡CPh, $(Ph)_2$C=O to obtain a series of new compounds LRSi=O ester, C-Si-C ring compound and C-Si-O ring compound. Characterized with NMR.

Computer Modeling and Analysis of Two-dimension Graphene on Nano Scale Chicago, IL

Supervisor: Prof. Erik Luijten, Northwestern University *02/2021-05/2021*

- Constructed computational models of armchair and zigzag graphene structure parameters by Material Studio.
- Compared and selected potential energy models (Tersoff, Rebo &Airebo) in Lammps and simulated thermal conductivity (TC) of graphene with its size based on MD simulation. Discovered TC increases with length and width due to proton transfer in the heat transfer process.
- Set a range of initial temperatures (T) and fit T gradient by the least square method in Origin. Simulated TC with T with settled size (8.52*4.92 nm). Found TC increased with T due to the plane structure of graphene.

Optimization of Synthesis Route of 2-hydroxymethylpyridine in Omeprazole Production Nanjing, CN

Supervisor: Prof. Haibin Zhu, Southeast University *09/2020-05/2022*

Sponsored by the Chinese National Innovation Project of Undergraduate Students, 20000 China Yuan

- Conducted nitrogen oxidation, nitration, methoxy substitution, acetic anhydride acylation, and rearrangement reactions of 2,3,5-trimethylpyridine & 3,5-dimethylpyridine to synthesize 2-hydroxymethylpyridine. Column chromatography for purification and IR, NMR for qualitative analysis.
- Improved methylation activity of O=$C(OCH_3)_2$ (DMC) by introducing substituents, enhancing basicity, increasing temperature etc. based on its $B_{AL}2$ methylation mechanism. Achieved a green route by replacing methylation reagent $(CH_3O)_2SO_2$ with DMC, methanol solvent with H_2O and toluene extractant with DCM.

Synthesis of Special Structural Silylene and Study of Reactivity of Electrons on Si Nanjing, CN

Supervisor: Prof. Hao Wang, Southeast University *10/2019-05/2021*

- Introduced -$SiMe_3$ on N atom of diisopropylaniline by n-BuLi and Me_3SiCl, used n-BuLi, $SiHCl_3$ and $LiN(SiMe_3)_2$ to obtain stable silylene with -$N(SiMe_3)_2$ substituent on the other side of N atom. Replaced $LiN(SiMe_3)_2$ with LiN(Ph)$SiMe_3$, $LiN(Ph)_2$ to explore the influence of higher steric hindrance on electron reactivity and frontier orbitals properties on Si of silylene. XRD and NMR for structure characterizations.
- Respectively reacted synthesized silylenes with H_2, alkynes, CO_2 to activate small molecules and synthesize silicon-containing derivatives. Successfully synthesized a disilene with special structure by silylenes.

LANGUAGES AND SKILLS

Language: Mandarin (Native), English (Proficient), Cantonese(Basic), Japanese (Basic).
Tool: C++, LAMMPS, Moldy, MestReNova, ChemDraw, Origin, Endnote, SciFinder, Jupyter, MS Office.
Lab: Glove Box, Schlenk Line, Clean Room, SEM, EDS, IR&FT-IR, XRD, NMR, XPS, Raman, TEM, BET, EDX, TGA, AFM, FIB, UV-Vis, GC-MS, HPLC, TLC, CC, FL-Microscope, Electrochem Workstation.