KEDANG CHEN

College of Chemistry and Molecular Engineering, Peking University, P.R. China
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EDUCATION

Peking University Beijing, China
College of Chemistry and Molecular Engineering, *Major* Sept 2020 – Present

- Relevant courses: Physical Chemistry, Physical Chemistry Lab, Structural Chemistry, Inorganic Chemistry Lab, Instrumental Analysis Lab, Quantitative Chemical Analysis, Advanced Mathematics, etc.

School of Physics, *Minor* Sept 2021 – Present

- Relevant courses: General Physics, General Physics Lab, Thermology, Optics, Quantum Mechanics, Methods of Mathematical Physics, Group Theory, etc.

Yale University New Haven, U.S.
Department of Chemistry, *Visiting Student* July 2023 – Present

PUBLICATION

1. Haocheng Xiong, Qiwen Sun, *Kedang Chen*, Yifei Xu, Xiaoxia Chang, Qi Lu*, and Bingjun Xu*. Correlating the Experimentally Determined CO Adsorption Enthalpy with the Electrochemical CO Reduction Performance on Cu Surfaces. *Angew. Chem. Int. Ed.* **2023**, *62*, e20221844.
2. Haocheng Xiong, Peiping Yu, *Kedang Chen*, Shike Lu, Tao Cheng, Bingjun Xu*, and Qi Lu*. Urea Synthesis via Electrocatalytic Oxidative Coupling of CO with NH3. (Under Review)

RESEARCH EXPERIENCES

Peking University (Department of Physical Chemistry, CCME) Beijing, China
RA, Undergraduate research under tuition of Prof. Bingjun Xu July 2021 –September 2022

Develop a spectroscopic method to determine the standard adsorption enthalpy of CO on Cu electrode

- Designed and constructed a special cell to determine the temperature dependence of CO adsorption. Developed several ATR-SEIRAS to characterize CO adsorption enthalpy on Cu electrode and estimate the absolute CO coverage.
- Determined the standard adsorption enthalpy of CO on Cu electrochemical interface for the first time. Further, high-pressure SEIRAS were employed to estimate the absolute CO coverage on Cu, which led to the determination of the standard adsorption Gibbs free energy and entropy of CO.
- Correlated the CORR activity with the absorption strength on Cu to indicate that the presence of stronger CO binding sites on OD Cu could favor C_{2+} products, which experimentally proved that CO binding energy is a key descriptor of CORR catalysts.

Peking University (Department of Physical Chemistry, CCME) Beijing, China
RA, Undergraduate research under tuition of Prof. Bingjun Xu October 2022 – March 2023

Use gas-diffusion type microfluidic electrolyzer to benchmark commercial Cu catalysts in CO_2RR

- Used gas-diffusion type microfluidic electrolyzer to evaluate CO_2RR performance of commercial Cu catalysts. Results suggested that commercial Cu catalysts can achieve similar or better performances compare to many reported designed Cu-based catalysts.
- Demonstrated that the catalyst loading could effectively impact the product distribution by altering the electrode potential, and showed that high CORR performance could be achieved with enhanced selectivity of acetate due to the higher local alkalinity at reaction interface.
- Our results highlighted the excellent intrinsic activity and selectivity of commercial Cu catalysts in CO_2RR, and suggested that future catalyst design should focus more on improving selectivity and reducing overpotential.

Peking University (Department of Physical Chemistry, CCME) Beijing, China
RA, Undergraduate research under tuition of Prof. Bingjun Xu December 2022 – June 2023

Investigate effective urea synthesis through electrocatalytic oxidative C-N bond formation

- Reported a novel electrocatalytic oxidative coupling strategy for urea synthesis for the first time. Demonstrated the catalytic performance with high formation rate and FE surpassing all reported synthesis via electrochemical coupling through quantitative evaluation.
- Proposed the mechanism through combined electrochemical, in-situ spectroscopic, and computational investigations.
- Provided a new route in urea formation with high electron efficiency and low energy consumption compared to the current industrial process undergoing co-reduction of CO_2 and nitrate.

Yale University (Department of Chemistry) New Haven, U.S.
RA, Research under tuition of Prof. Hailiang Wang July 2023 – present
CO_2 - methanol conversion under kinetic and thermodynamic guidance

- In progress.

SELECTED AWARDS AND HONORS

- Qin-Jin Scholarship (top 10%) 2020
- Award for Contribution in Student Organizations (outstanding volunteering during the pandemic) 2021-2022

ADDITIONAL INFORMATION

Research Interests

- Electrocatalytic mechanisms and applications
- In-situ/operando characterization techniques
- Renewable energy and negative carbon technologies