

Zhichuan MA

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EDUCATION

École Polytechnique – Paris, France

2022 – 2024

Studying for Energy environment: Science technology and management master

- GPA: 3.77/4.0
- Coursework: Thermodynamics, Machine learning, Optimization, Modelling
- Scholarships & Awards: Swiss Mobility (2023), EDF (2023), Erasmus+ (2024)

Zhejiang University – Hangzhou, China

2019 – 2023

Bachelor of Engineering in Energy & Environment Systems Engineering, and Certificate of Chu Kochen Honors program

- GPA: 3.72/4.0
- Coursework: Engineering Fluid Mechanics (92/100), Partial Differential Equations (92/100), Complex function and integral transformation (92/100), Numerical calculation method (89/100), Theory and Practice of Big Data Analysis of Energy System (88/100)
- Scholarships & Awards:
 - Qingshan international scholarship (2023-2024),
 - The second prize of the 13th National College Students Energy Conservation and Emission Reduction Competition (2021),
 - the first prize of the Zhejiang Province 3060 Green Point Design Creativity Competition (2021),
 - the first prize of the China Ping An Geek Charity Challenge (2021)

RESEARCH EXPERIENCE

Multi-criteria analysis based on Life-cycle assessment of a positive energy district accounting for a country context – application to real case study – Louvain-la-Neuve, Belgium 04.2024 – 10.2024

Energy Systems Optimization & Modeling Intern at [IMMC, UCLouvain](#)

supervised by [Prof. Hervé Jeanmart](#) (6 months)

- **LCA framework Integration:** On the basis of existing MILP model, integrated the LCA framework of the energy system optimization model [Energyscope](#) into the [REHO](#) energy system model, which makes the LCA results more reliable and enables more comprehensive multi-objective optimization.
- **LCA Database Creation:** Based on the Ecoinvent database and combined with the World IMPACT+ method, a life cycle assessment database covering 30 environmental impacts in resource extraction, operation and construction processes was built for all technologies in REHO.
- **Double counting removal:** Ensured data accuracy by removing double counting for precise LCA outcomes. (In ecoinvent, when the operational phase of a certain technology is considered, the construction phase is also inadvertently double-counted.)
- **Innovation:**
 - **Comprehensive LCA:** Modified constraints and objective functions in REHO to align with the new methodology from Energyscope, introducing multiple LCA indicators makes optimization more comprehensive. Optimized REHO using Dantzig-Wolfe decomposition, decomposing a district optimization problem into one master problem and a series of sub-problems (building optimization).
 - **Generalization and normalization of LCA indicators:** Applied a consistent methodology to compare results from two different energy system models. Normalized 27 environmental impact indicators and integrated them into the model for multi-objective optimization.
- **Internship Reports:** ongoing
- **Relevant link (updating):** [REHO with LCA](#)

Carbon footprints and cost evolution of green technologies – Sion, Switzerland

03.2023 – 09.2023

Life Cycle Assessment Intern at [IPESE, EPFL](#)

supervised by [Prof. François Maréchal](#) (6 months)

- **Research:** Conducted Life Cycle Assessment of green hydrogen electrolysis production
- **Cost and Environmental Impacts Analysis:** Life cycle assessment and cost methodologies were merged to create a model evaluating the cost and carbon footprint of PEMEC and SOEC manufacturing.
- **Innovation:**
 - **Model Development:** Created a novel, bottom-up model that concurrently assesses and compares the economic and environmental impacts of electrolysis cell manufacturing processes.
 - **Scaling Effect Exploration:** Provided an insight into the scalability of PEMEC and SOEC technologies by analyzing their cost and carbon footprint dynamics at varied manufacturing capacities.
- **Internship Reports:** [Estimating Future Costs and Carbon Footprints of PEMEC and SOEC Manufacturing](#)
- **Publications:** ongoing
- **Relevant link (updating):** [Personal website](#)

Experimental Research on Low-temperature Thermal Conversion of Polystyrene Waste Plastics in Two-step Process for Hydrogen Production – Hangzhou, China 09.2021 – 05.2022

Undergraduate Research Assistant at Zhejiang University

instructed by [Prof. Shurong Wang](#) (8 months)

- **Hydrogen Production Methodology:** Utilized a two-step method for hydrogen production through the hydrothermal directional depolymerization (<250°C) and liquid phase reforming (<260°C) of polystyrene
- **Catalyst Preparation:** Initiated the preparation of hydrothermal oxidation catalysts to enhance the selectivity of small molecule acids, such as acetic and formic acid, in the liquid phase product during liquid-phase reforming hydrogen production
- **Extension:** Undertook preliminary efforts to extrapolate the established methodology to other oxygenated olefins, notably lignin, to explore its applicability and efficiency across diverse materials
- **Relevant link:** [Personal website](#)

New-type electrode material intensified electro-fermentation system methane production device – Hangzhou, China 03. 2021 – 08. 2021

National University Student Social Practice and Science Contest on Energy Saving and Emission Reduction

instructed by [Prof. Jun Chen](#) (6 months)

- **Design and Material Innovation:** Engaged in designing electrode nano-arrays, integrating novel materials, specifically using ZIF67 nanosheets.
- **Utilization of Methanogens:** Employed methanogens with the novel electrode design to facilitate and optimize methane production processes
- **Enhanced Methane Production:** Achieved an approximately 35% increase in methane production compared to traditional methane production methodologies
- **Relevant link:** [Personal website](#)
- **Patents:**
 - [Turbulent flow type reaction kettle and method for producing methane;](#)
 - [Biogas preparation device and method](#)

SKILLS, ACTIVITIES & INTERESTS

Languages: Mandarin (Native), Wu Chinese (Native), English (Fluent), French (Basic)

Programming languages: Python, AMPL, C or C++, Matlab, R

Societies:

Secretary of the Youth League Committee of Zhejiang University (Organized and led student study sessions in linear algebra, enriching learning through invited senior expertise)

Volunteer Committee at Chu Kochen Honors college (upkeeping relationships with social volunteer groups and organizing off-campus events)

Volunteering:

Rural Agricultural Support Volunteer in China (2021)

Census Data Collection Volunteer (2020)