Lyuming PAN

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Education

M.E. Tsinghua University, Major: Instrument and Meter Engineering (Jun 2022) GPA 3.7/4.0

B.Sc. Tsinghua University, Major: Vehicle Engineering (Jun 2019) GPA 82/100

Research Interest

- Metal-air batteries and redox flow batteries
- Hydrogen production, hydrogen energy storage and fuel cells

Publications

- **LM Pan**, DF Chen*, PC Pei* et al. A novel structural design of air cathodes expanding three-phase reaction interfaces for zinc-air batteries. ***Applied Energy*** 2021;290:116777.
- DF Chen, **LM Pan***, PC Pei* et al. Carbon-coated oxygen vacancies-rich Co_3O_4 nanoarrays grow on nickel foam as efficient bifunctional electrocatalysts for rechargeable zinc-air batteries. ***Energy*** 2021;224:120142.

Patents

- PC Pei, **LM Pan** et al. Preparation method and device of magnesium alloy anode material Authorized Announcement Number: CN108649212B
- PC Pei, **LM Pan** et al. Metal air battery catalyst, air electrode and preparation method Applicated Announcement Number: CN110676470A
- PC Pei, **LM Pan** et al. Air electrode and its preparation method and metal air battery including air electrode. Applicated Announcement Number: CN110676466A

Research Experiences

Synthesis of bifunctional Co_3O_4-based catalysts using defective engineering

Student Researcher, Tsinghua University, Supervisor: *Prof.* Pucheng Pei Aug 2018–Jun 2019

- **Methods:** Prepared Carbon-coated oxygen vacancies-rich Co_3O_4 nanoarrays by hydrothermal reaction, plasma treatment and calcination. Used the method of SEM, XRD, TEM, EDS, RDE and EPR to characterize the material properties and catalytic activity.
- **Results:** The peak power density of zinc-air battery with proposed catalysts was 52.8% higher than that of untreated Co_3O_4. Coated carbon protected vacancies and prolonged cycle life to 358 h.

Novel structural design of air cathodes for zinc-air batteries increasing power output

Research Assistant, Tsinghua University, Supervisor: *Prof.* Pucheng Pei Jul 2019–Feb 2021

- **Methods:** Designed and fabricated air cathodes with novel structures which make three-phase reaction interfaces expand from 2D plane to 3D zone. Verified the electrochemical performances by LSV, EIS and constant current discharge.
- **Results:** A peak power density of 120 $mW \cdot cm^{-2}$ for zinc-air battery is achieved with δ-MnO_2 as catalysts when the loading is 1.0 $mg \cdot cm^{-2}$. Compared with previous reports, this work shows higher power density per catalyst loading.

Honors

- Scholarship for Outstanding Students, Tsinghua University 2019-2020

Reference

- Pucheng Pei (*Prof.* Tsinghua University, *Fellow* of SAE-China, pchpei@tsinghua.edu.cn)
- Ying Dong (*Assoc. Prof.* Tsinghua University, *Senior member* of CSMNT, dongy@tsinghua.edu.cn)