

# WEIRAN ZHENG

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Department of Applied Biology and Chemical Technology ◇ The Hong Kong Polytechnic University

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## EDUCATION

### Wuhan University

Ph.D. in Physical Chemistry

*Synthesis and Electrocatalytic Properties of Polymer-Stabilized Noble Metal Nanoparticles*

Supervisor: Prof. S. C. E. Tsang (Oxford) and Prof. X.L. Hong (Wuhan)

Wuhan, China

Sept., 2009 - Dec., 2015

### University of Oxford

Joint Ph.D. in Physical Chemistry

Supported by Chinese Scholarship Council

Oxford, United Kingdom

Oct., 2012 - Sept., 2014

### Wuhan University

B.S. in Chemistry

Wuhan, China

Sept., 2005 - June, 2009

## RESEARCH EXPERIENCE

### Hong Kong Polytechnic University

Postdoctoral Research Fellow

Hong Kong, China

May, 2016 - Present

#### Electrocatalysis

- Establish *in-situ* technique (UV-Vis, Raman, and AFM) to study the morphological and structural evolutions of electrocatalyst during electrochemical process;
- Water splitting (oxygen evolution reaction and hydrogen evolution reaction) study using 2D materials as the electrocatalyst;
- Glucose electrooxidation using metal ion (Cu, Co, and Ni) as electrocatalyst;

#### Battery Study

- (2015-2016) Study of the electrode structure evolution (anode and cathode) after cycling test of commercial 18650 Lithium ion battery (project in collaboration with GP batteries international™);
- 2D materials as battery anode;

### Hong Kong Polytechnic University

Research Assistant

Hong Kong, China

Dec., 2014 - May, 2016

- Carbon dioxide electroreduction using conductive polymer (polyaniline) stabilized metal nanoparticle composite;
- Development of glucose electrooxidation catalysts based on conductive polymer/graphene/metal nanoparticle composite;

### University of Oxford

Ph.D. Visiting Student

Oxford, United Kingdom

Oct., 2012 - Oct., 2014

- Development of conductive polymer (polythiophene, polyaniline)-metal nanoparticle composite for electrochemical and photochemical catalytic reaction: carbon monoxide electrooxidation, formic acid electrooxidation *et al.*;
- Shape-controlled synthesis of Pd, Pt nanocrystals for formic acid decomposition and using *in-situ* FTIR technique for surface adsorbed species mapping;

## PEER-REVIEWED PUBLICATIONS

# Co-first authorship

- W. Zheng, L.Y.S. Lee, Metal-Organic Frameworks for Electrocatalysis: Catalyst or Pre-catalyst? **2021**, *submitted*
- W. Zheng, L.Y.S. Lee, K. Y. Wong, Improving the Performance Stability of Direct Seawater Electrolysis: From Catalyst Design to Electrode Engineering, **2021**, *submitted*

3. W. Zheng, Y. Li, L.Y.S. Lee, Electrochemical Glucose Sensing with Low-Toxic Bismuth and Transition Metal-Doped Bismuth Nanoparticles, **2021**, *preparing*
4. J. Yan, X. Zhang, W. Zheng, L.Y.S. Lee, Interface Engineering of 2D-C<sub>3</sub>N<sub>4</sub>/NiFe-LDH Heterostructure for Highly Efficient Photocatalytic Hydrogen Evolution, *ACS Applied Materials & Interfaces*, **2021**, 21, 24723
5. W. Zheng, Y. Li, C.-S. Tsang, P.-K. So, L.Y.S. Lee, Stabilizer-Free Bismuth Nanoparticle for Selective Polyol Electrooxidation, *iScience*, **2021**, 24, 102342
6. W. Zheng,<sup>#</sup> Y. Li,<sup>#</sup> M. Liu, L.Y.S. Lee, Few-Layer Tellurium: Cathodic Exfoliation and Doping for Collaborative Hydrogen Evolution, *Small*, **2021**, 2007768 *featured as the front cover*
7. J. Choi,<sup>#</sup> D. Kim,<sup>#</sup> W. Zheng, B. Yan, Y. Li, L.Y.S. Lee, Y. Piao, Interface Engineered NiFe<sub>2</sub>O<sub>4-x</sub>/NiMoO<sub>4</sub> Nanowire Arrays for Electrochemical Oxygen Evolution, *Applied Catalysis B: Environmental*, **2021**, 286, 119857
8. L. Hu,<sup>#</sup> Y. Li,<sup>#</sup> X. Peng, W. Zheng, L.Y.S. Lee, P.K. Chu, K.-Y. Wong, TiO<sub>2</sub> Film Supported by Vertically Aligned Gold Nanorod Superlattice Array for Enhanced Photocatalytic Hydrogen Evolution, *Chemical Engineering Journal*, **2021**, 417, 127900
9. W. Zheng, M. Liu, L.Y.S. Lee, Best Practices in Using Foam-Type Electrodes for Electrocatalytic Performance Benchmark, *ACS Energy Letters*, **2020**, 5, 3260 - 3264
10. L. Hu, Y. Li, W. Zheng, Y.-K. Peng, S.C.E. Tsang, L.Y.S. Lee, K.-Y. Wong, Blue Order/Disorder Janus-Type TiO<sub>2</sub> Nanoparticles for Enhanced Photocatalytic Hydrogen Generation, *Journal of Materials Chemistry A*, **2020**, 8, 22828 - 22839
11. W. Zheng,<sup>#</sup> J. Lee,<sup>#</sup> Z. Gao, Y. Li, S. Lin, S. P. Lau, L.Y.S. Lee, Laser-assisted Ultrafast Exfoliation of Black Phosphorus in Liquid with Tunable Thickness for Li-ion Batteries, *Advanced Energy Materials*, **2020**, 10, 1903490 *featured as the front cover*
12. X. Zhang,<sup>#</sup> K.-A. Min,<sup>#</sup> W. Zheng, J. Hwang, B. Han, L.Y.S. Lee, Copper Phosphosulfides as a Highly Active and Stable Photocatalyst for Hydrogen Evolution Reaction, *Applied Catalysis B: Environmental*, **2020**, 273, 118927
13. W. Zheng,<sup>#</sup> M. Liu,<sup>#</sup> L.Y.S. Lee, Electrochemical Instability of Metal-Organic Frameworks: In Situ Spectroelectrochemical Investigation of the Real Active Sites, *ACS Catalysis*, **2020**, 20, 81 - 92 *highly cited paper, Clarivate*
14. W. Zheng, C.-S. Tsang, M. Liu, L.Y. So, L.-C. Leung, L.Y.S. Lee, Highly Efficient Stepwise Electrochemical Degradation of Antibiotics in Water by *in situ* Formed Cu(OH)<sub>2</sub> Nanorods, *Applied Catalysis B: Environmental*, **2019**, 256, 117824
15. Z. Gao, M. Liu, W. Zheng, X. Zhang, L.Y.S. Lee, Surface Engineering of MoS<sub>2</sub> via Laser-induced Exfoliation in Protic Solvents, *Small*, **2019**, 15, 1903791
16. Z. Gao, W. Zheng, L.Y.S. Lee, Highly Enhanced Pseudocapacitive Performance of Vanadium-doped MXenes in Neutral Electrolytes, *Small*, **2019**, 15, 1902649
17. W. Zheng, Y. Li, L.Y.S. Lee, Insights into the Transition Metal Ion-mediated Electrooxidation of Glucose in Alkaline Electrolyte, *Electrochimica Acta*, **2019**, 308, 9-19
18. [\(Review article\)](#) W. Zheng,<sup>#</sup> C.-S. Tsang,<sup>#</sup> L.Y.S. Lee, K.-Y. Wong, Two-dimensional Metal-Organic Framework and Covalent-Organic Framework: Synthesis and their Energy-related Applications, *Materials Today Chemistry*, **2019**, 12, 34-60
19. W. Zheng, Y. Li, L. Hu, L.Y.S. Lee, Use of Carbon Supports with Copper Ion as a Highly Sensitive Non-Enzymatic Glucose Sensor, *Sensors & Actuators B: Chemical*, **2019**, 282, 187-196
20. M. Liu, W. Zheng, S. Ran, S.T. Boles, L.Y.S. Lee, Overall Water Splitting Electrocatalysts based on 2D CoNi Metal-Organic Frameworks and Its Derivative, *Advanced Materials Interfaces*, **2018**, 5, 1800849 *featured as the inside cover*
21. Y. Li, L. Hu, W. Zheng, X. Peng, M. Liu, P. K. Chu, L. Y. S. Lee, Ni/Co-Based Nanosheet Arrays for Efficient Oxygen Evolution Reaction, *Nano Energy*, **2018**, 52, 360-368

22. W. Zheng,<sup>#</sup> Y. Li,<sup>#</sup> M. Liu, C.-S. Tsang, L.Y.S. Lee, K.-Y. Wong, Cu<sup>2+</sup>-doped Carbon Nitride/MWCNT as an Electrochemical Glucose Sensor, *Electroanalysis*, **2018**, 30, 1446-1454
23. W. Zheng, Y. Li, C.-S. Tsang, L. Hu, M. Liu, B. Huang, L.Y.S. Lee, K.-Y. Wong, Cu<sup>II</sup>-mediated Ultra-efficient Electrooxidation of Glucose, *ChemElectroChem*, **2017**, 4, 2788-2792
24. W. Zheng, H.W. Man, L. Ye, S.C.E. Tsang, Electroreduction of Carbon Dioxide to Formic Acid and Methanol over a Palladium/Polyaniline Catalyst in Acidic Solution: A Study of the Palladium Size Effect, *Energy Technology*, **2017**, 5, 937-944
25. A. Kolpin, G. Jones, S. Jones, W. Zheng, J. Cookson, A. PE York, P. J Collier, S.C.E. Tsang, Quantitative Differences in Sulfur Poisoning Phenomena over Ruthenium and Palladium: An Attempt to Deconvolute Geometric and Electronic Poisoning Effects Using Model Catalysts, *ACS Catalysis*, **2017**, 7, 592-605
26. W. Zheng, S. Nayak, W. Yuan, Z. Zeng, X. Hong, K.A. Vincent, S.C.E. Tsang, A Tunable Metal-polyaniline Interface for Efficient Carbon Dioxide Electro-Reduction to Formic Acid and Methanol in Aqueous Solution, *Chemical Communications*, **2016**, 52, 13901-13904
27. W. Zheng, L. Hu, L.Y.S. Lee, K.-Y. Wong, Copper Nanoparticles/Polyaniline/Graphene Composite as a Highly Sensitive Electrochemical Glucose Sensor, *Journal of Electroanalytical Chemistry*, **2016**, 781, 155-160
28. W. Zheng, J. Qu, X. Hong, K. Tedsree, S.C.E. Tsang, Probing the Size and Shape Effects of Cubic- and Spherical-Shaped Palladium Nanoparticles in the Electrooxidation of Formic Acid, *ChemCatChem*, **2015**, 7, 3826-3831
29. S. Jones, S.M. Fairclough, M. Gordon-Brown, W. Zheng, A. Kolpin, B. Pang, W.C.H. Kuo, J.M. Smith, S.C.E. Tsang, Dual Doping Effects (Site Blockage and Electronic Promotion) Imposed by Adatoms on Pd Nanocrystals for Catalytic Hydrogen Production, *Chemical Communications*, **2015**, 51, 46-49
30. K. Nakagawa, T. Jia, W. Zheng, S. M. Fairclough, M. Katoh, S. Sugiyama, S.C.E. Tsang, Enhanced Photocatalytic Hydrogen Evolution from Water by Niobate Single Molecular Sheets and Ensembles, *Chemical Communications*, **2014**, 50, 13702-13705
31. W. Zheng, S. Jones, X. Hong, S.C.E. Tsang, Photo and Electronic Excitation for Low Temperature Catalysis Over Metal Nanoparticles Using an Organic Semiconductor, *RSC Advances*, **2014**, 4, 47488-47496
32. J. Ge, Z. Zeng, F. Liao, W. Zheng, X. Hong, S.C.E. Tsang, Palladium on Iron Oxide Nanoparticles: the Morphological Effect of the Support in Glycerol Hydrogenolysis, *Green Chemistry*, **2013**, 15, 2064-2069
33. F. Liao, Y. Huang, J. Ge, W. Zheng, K. Tedsree, P. Collier, X. Hong, S.C.E. Tsang, Morphology-dependent Interactions of ZnO with Cu Nanoparticles at the Materials's Interface in Selective Hydrogenation of CO<sub>2</sub> to CH<sub>3</sub>OH, *Angewandte Chemie International Edition*, **2011**, 50, 2162-2165
34. Y. Huang, F. Liao, W. Zheng, X. Liu, X. Wu, X. Hong, S.C.E. Tsang, Temperature and Solvent-dependent Morphological Sol-Gel Transformation: an *in-situ* Microscopic Observation, *Langmuir*, **2010**, 26, 3106-3114

## BOOK CHAPTERS

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1. W. Zheng, Y. Li, L.Y.S. Lee, Earth-Abundant Metal-Based Nanomaterials for Electrochemical Water Splitting, in title "Functional Nanomaterials: Synthesis, Properties and Applications", Wiley-VCH, **2021**

## PATENTS

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1. S.C.E. Tsang, W. Zheng, X. Hong, Synthesis and Application of Visible Light-responsive Metal-Organic Semiconductor Photocatalyst  
Chinese patent: CN103406152B Granted 2015

## ACADEMIC ACTIVITIES

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- (invited) Laser-Assisted Exfoliation of Black Phosphorus with Thickness Control for Li-Ion Batteries, ECS Meeting Abstracts, **Nov., 2020**
- 5<sup>th</sup> International Summer School Spectroelectrochemistry, Leibniz Institute for Solid State and Materials Research (IFW), Dresden, Germany, **Sep., 2019**
- Workshop on Bruker™ Surface Probe Microscope, Guangzhou, China, **Dec., 2018**
- Oral report: *CO<sub>2</sub> Electroreduction Using Metal/Conductive Polymer Composite*, The 15<sup>th</sup> National Youth Conference on Catalysis, China, **July, 2015**
- Poster: *Pd/Polythiophene as Photocatalyst for Environmental VOCs Decomposition*, iChemE: Progress & Challenges in Environmental Catalysis, United Kingdom, **June, 2014**

## FUNDINGS

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- *Design of High-efficient and High-selective Photoelectrochemical CO<sub>2</sub> Reduction Catalyst* 2018 - 2020  
Science Foundation of Shenzhen (JCYJ20170818105046904) Co-P.I.
- *Synthesis and Tuning of Cu/ZnO Nanocrystal Interfaces for Catalytic CO<sub>2</sub> Reduction* 2012 - 2015  
National Natural Science Foundation of China (21373153) Co-P.I.

## MEMBERSHIP OF PROFESSIONAL SOCIETIES

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|---|------------|
| Chinese Chemical Society (CCS)                  | Since 2012 |
| International Society of Electrochemistry (ISE) | Since 2019 |

## TECHNICAL STRENGTHS

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|-------------------------------|---|
| Data Analysis & Visualization | OriginLab, R-based language, Adobe Illustrator  |
| Academic Software             | ChemBioOffice, Crystal Maker, Cinema4D, L <sup>A</sup> T <sub>E</sub> X, Blender                      |
| Techniques                    | AFM (Bruker Certified SPM Operator), STM, Electrochemistry (CV, LSV, EIS, FTacV), XRD, TEM, SEM, FTIR |
|                               | <i>in-situ</i> electrochemical UV-Vis spectroscopy  |
| Language                      | Chinese (native), English (fluent)  |

## ACADEMIC SERVICE

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- Reviewer for some peer-reviewed journals, including: *Communications Chemistry*, *Sensors and Actuators B: Chemical*.

## REFEREES

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Updated on June 29, 2021