

## Hong Phong DUONG

PhD Student

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### RESEARCH INTERESTS

*Photo(electro)catalysts for sustainable energy and inorganic materials chemistry.*

### SUMMARY

Since January 2021, I have been working with Prof. Marc Fontecave and Dr. Ngoc Huan Tran at Collège de France. My research is about Cu-based electrocatalysts such as dendritic copper oxide for CO and CO<sub>2</sub> conversion to multicarbon products in a flow-cell electrolyzer. In collaboration with TotalEnergies, the target of this project is to achieve efficient electrochemical CO and CO<sub>2</sub> reduction systems for the production of high-value chemicals such as ethylene, ethanol and n-propanol which are expected to show industrial scale application in the near future.

From 2017 to 2020, I worked on a project about photocatalytic water splitting in the groups of Prof. Masato Kakihana and Prof. Hideki Kato at Tohoku University. I developed a new spray drying synthesis and surface modification with two kinds of noble metal to obtain highly active Rh-doped SrTiO<sub>3</sub> photocatalysts for water splitting reaction. This project was aimed at achieving an economical and highly active system for the production of hydrogen as a green fuel.

### PUBLICATIONS

5. **H. P. Duong**, J. G. Rivera de la Cruz, N.H. Tran, J. Louis, S. Zanna, D. Portehault, A. Zitolo, M. Walls, D.V. Peron, M.W. Schreiber, N. Menguy, M. Fontecave, "Silver and Copper Nitride Cooperate for CO Electroreduction to Propanol", [\*Angewandte Chemie\* \(2023\)](#).
4. **H.P. Duong**, N.H. Tran, G. Rouse, S. Zanna, M.W. Schreiber, M. Fontecave, "Highly selective copper-based catalysts for electrochemical conversion of carbon monoxide to ethylene using a gas-fed flow electrolyzer", [\*ACS Catal.\*, 12, 10285-10293 \(2022\)](#).

3. N.H. Tran, **H.P. Duong**, G. Rouse, S. Zanna, M.W. Schreiber, M. Fontecave, “Selective ethylene production from CO<sub>2</sub> and CO reduction via engineering membrane electrode assembly with porous dendritic copper oxide”, [\*ACS Appl. Mater. Interfaces\*, 14, 31933-31941 \(2022\)](#).
2. D.N. Minh, **H.P. Duong**, L. Hoang, N.D. Phuc, P.D. Tran, P.N. Hong, “Plasma-assisted preparation of MoS<sub>2</sub>/graphene/MOF hybrid materials and their electrochemical behaviours”, [\*Materials Transactions\*, 61, 1535-1539 \(2020\)](#).
1. **H.P. Duong**, T. Mashiyama, M. Kobayashi, A. Iwase, A. Kudo, Y. Asakura, S. Yin, M. Kakihana, H. Kato, “Z-scheme water splitting by microspherical Rh-doped SrTiO<sub>3</sub> photocatalysts prepared by a spray drying method”, [\*Applied Catalysis B: Environmental\*, 252, 222-229 \(2019\)](#).

## PATENT APPLICATION

2. Highly efficient copper nitride bimetallic catalyst for electrochemical CO reduction to n-propanol, application date: 24/10/2022.
1. Catalyst for electrochemical conversion of CO to ethylene, application date: 10/01/2022.

## RESEARCH EXPERIENCES

- 2021–Present **PhD in Chemistry**, Collège de France and Sorbonne University, France
- 2017–2020 **Research Assistant and MEng in Chemical Engineering**, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University
- 2016 **Intern**, International Center for Materials Nanoarchitectonics, National Institute for Materials Science, Japan

## CONFERENCE PRESENTATIONS

### Oral

- 03/2023 **3<sup>rd</sup> MOMENTOM International Congress**, Saclay, France  
“Selective electrochemical reduction of CO to n-propanol and ethanol by nitride-derived bimetallic catalysts”.
- 11/2022 **6<sup>èmes</sup> journées du GDR Solar Fuels**, Fréjus, France  
“Highly efficient dendritic copper and nitride-derived bimetallic electro catalysts for CO reduction to multicarbon”.
- 01/2019 **The 57<sup>th</sup> Symposium on Basic Science of Ceramics**, Sendai, Japan  
“Synthesis of well-dispersive highly active Rh-doped SrTiO<sub>3</sub> photocatalyst by spray drying method”.
- 09/2018 **The 122<sup>nd</sup> Catalysis Society of Japan Meeting**, Hakodate, Japan  
“Modification of Rh-doped SrTiO<sub>3</sub> with two kinds of cocatalyst for improvements of Z-schematic overall water splitting”.
- 03/2018 **The 98<sup>th</sup> Chemical Society of Japan Annual Meeting**, Funabashi, Japan

“Influences of synthetic methods of Rh-doped SrTiO<sub>3</sub> on Z-schematic overall water splitting”.

## Poster

- 05/2022 **Renewable Energy: Solar Fuels-Gordon Research Conference**, Barga, Italy  
“Dendritic copper catalyst combined with alkaline flow cell reactor as a highly efficient system for electrochemical CO reduction to ethylene”.
- 11/2019 **International Conference on Materials and Systems for Sustainability**, Nagoya, Japan  
“Improvement of Activity of Rh-doped SrTiO<sub>3</sub> Photocatalyst Aiming at Enhancement of Efficiency of Z-scheme Water Splitting”.
- 09/2019 **The 124<sup>th</sup> Catalysis Society of Japan Meeting**, Nagasaki, Japan  
“Improvement of activities of Z-scheme systems composed of SrTiO<sub>3</sub>:Rh and BiVO<sub>4</sub> by deposition of two kinds of cocatalyst on SrTiO<sub>3</sub>:Rh”.
- 05/2019 **TU-USTB Joint Symposium**, Sendai, Japan  
“Preparation of microspherical Rh-doped SrTiO<sub>3</sub> photocatalysts by a spray drying method and its application in Z-scheme water splitting”.
- 11/2017 **2017 Ceramic Society of Japan Tohoku-Hokkaido Branch Symposium**, Sendai, Japan  
“Synthesis of SrTiO<sub>3</sub>:Rh by a spray dry method employing a water-soluble titanium complex”.
- 09/2017 **The 120<sup>th</sup> Catalysis Society of Japan meeting**, Matsuyama, Japan  
“Study on improvement of efficiencies of Z-scheme systems employing SrTiO<sub>3</sub>:Rh and BiVO<sub>4</sub>”.