Donglong Fu (Postdoctoral scholar at Caltech)

Citizenship: China
Date of Birth: March 30, 1990
Highest degree: PhD. in Physical Chemistry (Feb. 2020 @ Utrecht University)
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Google scholar: https://scholar.google.com/citations?user=jGehJlYAAAAJ&hl=zh-CN
Personal webpage: https://donglongfu.wixsite.com/zeolites
Research interests: Microporous materials, carbon capture, C1 chemistry, structure-performance relationships, spectroscopy

RESEARCH EXPERIENCE

CO_2 capture and utilization (Postdoc)

- Direct air capture from humid air using microporous materials
- CO_2 and CH_4 co-conversion using zeolite membrane reactors (*awarded together with supervisor a Proof of Concept grant from the European Research Council*)

Zeolites (Membrane) Synthesis (PhD)

- Synthesis and characterization of zeolites and zeolitic membranes for catalysis and separation
  1. *Angew. Chem. Int. Ed.,* ***2018****, 57, 12458*
  2. *Angew. Chem. Int. Ed.,* ***2017****, 56, 11217 (****cover story****)*
  3. *Angew. Chem. Int. Ed.,* ***2016****, 55,* 16044 (2nd author)

Catalysis and Spectroscopy (PhD and Master)

- Structure-performance relationships for the methanol-to-hydrocarbons and syngas to lower olefins processes
  1. *Angew. Chem. Int. Ed.,* ***2020****, 10.1002/anie.202009139 (****front cover*** *and* ***hot paper in*** *Angew. Chem.,* ***highlighted by Chemistryviews****)*
  2. *Angew. Chem. Int. Ed.,* ***2020****, 59, 15502*
  3. *Chem. Commum.,* ***2017****, 53,* 13012 (***cover story***)
  4. *ChemCatChem,* ***2015****, 7,* 752 (***cover story***)
- Study of reaction kinetics of the oxidation of ethylene glycol to glyoxal on copper (collaborated with BASF)

EDUCATION & WORK EXPERIENCE

Postdoctoral scholar • California Institute of Technology (Caltech) • Jan. 2020-Present

- Supervisor: Prof. Mark E. Davis (elected member of the National Academy of Engineering, the National Academy of Science and the Institute of Medicine in the United States)
- Project: Rational Design of Microporous Materials for Direct Air Capture under Humid Conditions ($ 400K)

Postdoctoral scholar • Utrecht University (UU) • Sep. 2020-Dec. 2020

- Funded by a European Research Council (ERC) Proof of Concept Grant (€ 150 K)
- Supervisor: Prof. Bert M. Weckhuysen (elected member of the Royal Dutch Academy of Sciences, the European Academy of Science and the Royal Flemish Academy of Belgium for Sciences and Arts)
- Project: High-flux zeolite membrane-based reactor for the efficient conversion of CO_2 and CH_4

PhD candidate in Physical Chemistry • UU • Sep. 2015-Aug. 2019

- Funded by a European Research Council (ERC) Advanced Grant (No. 321140, € 2.3 million)
- Supervisor: Prof. Bert M. Weckhuysen
- Thesis: Oriented Zeolite Membranes: Synthesis, Characterization and Applications

MS in Chem. Eng. • East China University of Science and Technology (ECUST) • 2015 • Ranking 1/250

- Supervisors: Prof. Yi-Fan Han and Prof. Jing Xu
- Thesis: Structure-Performance Relationships of an Iron Oxide Catalyst for Fischer-Tropsch Synthesis

BS in Chem. Eng. • Northwest University (NWU) • 2012 • Ranking 1/94

SCHOLARSHIPS & AWARDS

- Chinese government award for outstanding self-finance students abroad • **2020**
- Distinguished alumni in 20 years at the ChE school of NWU • **2019**
- Full scholarship for PhD studying at Utrecht University • **2015-2019**
- Outstanding graduates for ECUST (**2015**) and NWU (**2012**)
- The first prize of Wanhua (Co.) Innovation Competition • **2014**
- The first prize scholarship at ECUST • **2013**
- Outstanding students for NWU (**2009-2012)** and ECUST (**2013**)
- State first Prize of "Mitsui Cup" Competition of Chemical Engineering Design (Team leader) • **2011**
- Cyrus Tang Scholarship for Personal Development and Community Service • **2009-2012**

SKILLS

Materials: Zeolites (membranes) synthesis and characterization (XRD, NH_3-TPD, FTIR, SEM, GC-MS, AFM, *etc.*)
Heterogenous catalysis: Ambient/high pressure and high temperature fixed bed reactors design and operation
Adsorption and separations: Design and construction of setups as well as performance evaluation
Advanced spectroscopy: (*Operando)* UV-Vis, DRIFTS, Raman spectroscopy and solid-state NMR as well as Nanospectroscopy, such as AFM-IR, Single Molecule Fluorescence and Atom Probe Tomography

PROFESSIONAL CONTRIBUTION

- Daily supervisor of two bachelor's students (2018) and 1 master's student (2018-2019) at UU for their theses
- Teaching electrochemistry courses for first year bachelor students at UU for 3 years (2016-2019)
- Reviewer for *J. of Catal., Chem. Commun., Chem. Eng. Sci.* and *J. Energy Chem.*

Scientific Contributions

As of Sep., 2020, Donglong Fu (***H index= 12***) published **23 papers** in highly impact peer-reviewed journals, such as *Nat. Mat., J. Am. Chem. Soc., Angew. Chem. Int. Ed., ACS Catal., etc*. Among these, **6 papers** are published as **(co-)first author** in ***Angew. Chem. Int. Ed. (4), Chem. Commun. (1) and ChemCatChem (1)***; **7 papers** are selected as **cover story**; **1 paper** is highlighted as **hot paper** in *Angew. Chem. Int. Ed.* and *Chemistryviews* magazine, **1 paper** is highlighted by *Nature Energy*.

25. **D. Fu**, E. Maris, D. M. Salas Pastene, M. Veselý, O. van der Heijden, F. Meirer, L. Kapitein, B. M. Weckhuysen, Visualizing Diffusion Patterns in Zeolite ZSM-5 using Single Molecule Fluorescence Spectroscopy, **2020**, *In preparation***.**
24. **D. Fu**, M. Filez, M. Veselý, S. Zanoni, D. H. Merino, F. Meirer, B. M. Weckhuysen, In Situ SAXS of Zeolite Growth: A Comparison Study of Ethanol and Tetrapropylammonium, **2020**, *In preparation*.
23. E. Maris, **D. Fu**, F. Meirer, B. M. Weckhuysen, Single-Molecule Observation of Diffusion and Catalysis in Nanoporous Solids, *Adsorprtion*, **2020**, *accepted*. (**Invited book chapter**)
22. H. Dai, Y. Shen, T. Yang, C. Lee, **D. Fu**, A. Agarwal, T. T. Le, M. Tsapatsis, J. C. Palmer, B. M. Weckhuysen, P.J. Dauenhauer, X. Zou, J. D. Rimer, Finned Zeolite Catalysts*,* ***Nat. Mat.*** *2020,* 19, 1074-1080. (**Front cover**)
21. **D. Fu**$^{+}$, A. Lucini Paioni^{+} **(co-first author),** C. Lian, O. van der Heijden, M. Baldus, B. M. Weckhuysen, Elucidating Zeolite Channel Geometry-Reaction Intermediates Relationships during the Methanol-to-Hydrocarbons Process, ***Angew. Chem. Int. Ed.*** 2020, 59, 20024-20030. (**Front Cover, hot paper, highlighted by chemistryviews**)
20. **D. Fu**, O. van der Heijden, K. Stančiaková, B. M. Weckhuysen, Channel Orientation Effects of MFI zeolite in Catalytic Reactions, ***Angew. Chem. Int. Ed.*** 2020, 59, 15502-15506.
19. B. Birmingham, J. Yuan, M. Filez, **D. Fu**, J. Hu, J. Lou, M. O Scully, B. M Weckhuysen, Z. Zhang, Probing the Effect of Chemical Dopant Phase on Photoluminescence of Monolayer MoS2 Using in Situ Raman Microspectroscopy, *J. Phys. Chem. C.*, **2019**, 123, 15738-15743.
18. G. Whiting, S.H. Chung, D. Stosic, A. Dutta Chowdhury, L. van der Wal, **D. Fu**, J. Zečević, A. Travert, K. Houben, M. Baldus, B. M. Weckhuysen, Multi-Scale Mechanistic Insights of Shaped Catalyst Body Formulations and Their Impact on Catalytic Properties, **2019**, ***ACS Catal.*****,** 2019, 9, 4792-4803.
17. A. D. Chowdhury, A. L. Paioni, G. T. Whiting, **D. Fu**, M. Baldus, B. M. Weckhuysen, Unraveling the Homologation Reaction Sequence of the Zeolite-Catalyzed Ethanol-to-Hydrocarbon Process, ***Angew. Chem. Int. Ed.,*** **2019**, *58*, 3908-3912.
16. B. Birmingham, J. Yuan, M. Filez, **D. Fu**, J. Hu, J. Lou, M. O. Scully, B. M. Weckhuysen, Z. Zhang, Spatially-

Resolved Photoluminescence of Monolayer MoS2 under Controlled Environment for Ambient Optoelectronic Applications, *ACS Appl. Nano Mater.*, **2018**, *1*, 6226-6235.

15. Y. Shen, T. T. Le, **D. Fu**, J. E. Schmidt, M. Filez, B. M. Weckhuysen, J. D. Rimer, Deconvoluting the Competing Effects of Zeolite Framework Topology and Diffusion Path Length on Methanol-to-Hydrocarbons Reaction, ***ACS. Catal.*, 2018**, *8,* 11042-11053.
14. **D. Fu**, J. E. Schmidt, P. Pletcher, P. Karakiliç, X. Ye, C. M. Vis, P. C. A. Bruijnincx, M. Filez, L. D. B. Mandemaker, L. Winnubst, B. M. Weckhuysen, Uniformly Oriented Zeolite ZSM-5 Membranes with Tunable Wettability on a Porous Ceramic**, *Angew. Chem. Int. Ed.* 2018**, *57*, 12458-12462.
13. J. E. Schmidt, L. Peng, A. Lucini Paioni, H. Leona Ehren, W. Guo, B. Mazumder, D. A. Matthijs de Winter, Ö. Attila, **D. Fu**, A. Dutta Chowdhury, K. Houben, M. Baldus, J. D. Poplawsky, and B. M. Weckhuysen, Isolating Clusters of Light Elements in Molecular Sieves with Atom Probe Tomography, ***J. Am. Chem. Soc.***, **2018**, *140*, *9154–9158*.
12. J. E. Schmidt, F. C. Hendriks, M. Lutz, L. C. Post, **D. Fu**, B. M. Weckhuysen, Diagnosing the Internal Architecture of Zeolite Ferrierite, *ChemPhysChem* **2018**, *19*, 367-372. (**Cover Story**)
11. Y. Zhang, **D. Fu**, X. Liu, Z. Zhang, C. Zhang, B. Shi, J., Y.-F. Han, Operando Spectroscopic Study of Dynamic Structure of Iron Oxide Catalysts during CO_2 Hydrogenation, *ChemCatChem* **2018**, *10*, 1-6.
10. **D. Fu,** K. Park, G. Delen, Ö. Attila, F. Meirer, D. Nowak, S. Park, J. E. Schmidt, B. M. Weckhuysen, Nanoscale Infrared Imaging of Zeolites using Photoinduced Force Microscopy, *Chem. Commum.,* **2017**, *53*, 13012-13014. (**Cover Story**)
9. **D. Fu**, J. E. Schmidt, A. D. Chowdhury, B. M. Weckhuysen, Highly Oriented Growth of Catalytically Active Zeolite ZSM-5 Films with a Broad Range of Si/Al Ratios, ***Angew. Chem. Int. Ed.*** **2017**, *56*, 11217-11221. (**Cover Story**)
8. J. E. Schmidt, **D. Fu**, M. W. Deem, B. M. Weckhuysen, Template-Framework Interactions in Tetraethylammonium-Directed Zeolite Synthesis, ***Angew. Chem. Int. Ed.*** **2016**, *55*, 16044-16048.
7. J. E. Schmidt, J. D. Poplawsky, B. Mazumder, Ö. Attila, **D. Fu**, D. A. Matthijs de Winter, F. Meirer, S. R. Bare and B. M. Weckhuysen, Coke Formation in a Zeolite Crystal During the Methanol-to-Hydrocarbons Reaction as Studied with Atom Probe Tomography, ***Angew. Chem. Int. Ed.*** **2016**, *55*, 11173-11177. (**Highlighted by Nature Energy**)
6. Y. Zhang, **D. Fu**, X. Xu, Y. Sheng, J. Xu, Y.-F. Han, Application of *Operando* Spectroscopy on Catalytic Reactions, *Curr. Opin. Chem. Eng.* **2016**, *12*, 1-7. (**Invited Review**)
5. J. Su, Z. Zhang, **D. Fu**, D. Liu, X. Xu, B. Shi, X. Wang, R. Si, Z. Jiang, J. Xua, Y.-F. Han, Higher Alcohols Synthesis from Syngas over CoCu/SiO_2 Catalysts: Dynamic Structure and the Role of Cu, *J. Catal.* **2016**, *336*, 94-106. (**Feature Article**)
4. W. Mao, J. Su, Z. Zhang, X. Xu, **D. Fu**, W. Dai, J. Xu, X. Zhou, Y.-F. Han, A Mechanistic Basis for the Effects of Mn Loading on C2+ Oxygenates Synthesis Directly from Syngas over Rh-MnOx/SiO_2 Catalysts, *Chem. Eng. Sci.,* **2015**, *135*, 301-311.
3. W. Mao, J. Su, Z. Zhang, X. Xu, W. Dai, **D. Fu**, J. Xu, X. Zhou, Y.-F. Han, Kinetics Study of C2+ Oxygenates Synthesis from Syngas over Rh-MnOx/SiO_2 Catalysts, *Chem. Eng. Sci.,* **2015**, *135*, 312-322.
2. **D. Fu**, W. Dai, X. Xu, W. Mao, J. Su, Z. Zhang, B. Shi, J. Smith, P. Li, J. Xu, Y.-F. Han, Probing the Structure Evolution of Iron-Based Fischer-Tropsch to Produce Olefins by *Operando* Raman Spectroscopy, *ChemCatChem,* **2015**, *7*, 752-756. (**Cover Story**)
1. X. Xu, J. Su, P. Tian, **D. Fu**, W. Dai, W. Mao, W. Yuan, J. Xu, Y.-F. Han, "First Principles Study of C2 Oxygenates Synthesis Directly from Syngas over Co-Cu Bimetallic Catalysts", *J. Phys. Chem. C.*, **2015**, *119***,** 216-227.

Patents

- Chinese Patent: *An in situ Gas-Solid Reaction Cell for High-Pressure Spectroscopy*, CN103728247A.

Presentations (as the presenter)

1. **Invited Oral Presentation:** *Oriented Zeolite Thin-Films as Model Systems for Reaction Behaviors Study, Nanocatalysis for Fuels and Chemicals Workshop,* Lille 1 University, **France**, 19-04-2019.
2. **Oral Presentation:** Channel Orientation Effects of MFI zeolite during Methanol-to-Hydrocarbons Process, NAM26, Chicago, **United States**, 23 to 28-06-2019.
3. **Invited oral presentation:** An Oriented Microporous Membrane for Chemical Industry Applications, CHAINS2018 (Dutch chemistry conference), Veldhoven, **The Netherlands**, 3 to 5-12-2018.
4. **Invited oral presentation:** Oriented Zeolite Membranes with Controllable Performance, Dutch Zeolite Association

(DZA) meeting 2018, Amsterdam, **The Netherlands**, 11-10-2018.

5. **Oral presentation:** Nanoscale Infrared Imaging of Zeolites Using Photoinduced Force Microscopy, International Symposium on Zeolites and Microporous Crystals 2018, Yokohama, **Japan**, 5 to 10-08-2018.
6. **Invited poster presentation:** Synthesis of Highly Oriented Zeolite ZSM-5 Films as Catalysts and Model Catalytic Systems, Materials • Characterization • Catalysis, ETH, **Switzerland**, 07-01-2018.
7. **Oral presentation:** Fluorescence Microscopy-Assisted Fabrication of Highly *b*-Oriented Aluminosilicate MFI Films, the 13th European Congress on Catalysis, Florence, **Italy**, 27 to 31-08-2017.
8. **Poster presentation:** Synthesis of Highly Oriented Zeolite ZSM-5 Films as Catalysts and Model Catalytic Systems, Nanoporous Materials and Their Applications in GRC, Andover, **United States**, 06 to 11-08-2017.
9. **Oral presentation:** Fabrication of Highly *b*-Oriented Aluminosilicate MFI Films with a Broad Range of Si/Al Ratios, The 18th Netherlands' Catalysis and Chemistry Conference, Noordwijkerhout, **The Nerthelands**, 07-03-2017.
10. **Poster presentation:** Fabrication of *b*-Oriented Aluminosilicate MFI Films: Influence of Aluminum on Film Morphology and Orientation, the 3rd Euro-Asia Zeolite Conference, Bali, **Indonesia**, 24-01-2017.
11. **Poster presentation:** Probing the Structure Evolution of Iron-Based Fischer-Tropsch to Produce Olefins by *Operando* Raman Spectroscopy, 2nd China-United States Symposium on Energy, Shanghai, **China**, 28-06-2015. (**Best Poster**)