Yurun Miao

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**EDUCATION**

**Sept. 2012 – Dec. 2017**

Ph. D., Chemistry, *University of Illinois at Urbana-Champaign (UIUC), Urbana, IL*

* Dissertation: “Mechanochemistry of Metal-Organic Frameworks under Compression”

**Sept. 2008 – Jun. 2012**

B.S., Chemistry, *Nanjing University, Nanjing, China*

**RESEARCH EXPERIENCE**

**Nov. 2023 – present**

Assistant Research Scientist, *Johns Hopkins University (JHU), Baltimore, MD*

Advisor: Prof. Michael Tsapatsis

**Nov. 2018 – Oct. 2023**

Postdoctoral Fellow, *Johns Hopkins University (JHU), Baltimore, MD*

Advisor: Prof. Michael Tsapatsis

**Controlled vapor deposition of metal-organic framework (MOF) films**

* Prepared metal oxide thin films on planar and porous substrates via ALD
* Prepared MOF films and membranes by organic vapor treatment of metal oxides

**Electron beam (EB) induced modification of MOFs**

* Discovered area-selective growth of MOFs by EB-induced surface passivation
* Studied dose and development conditions for MOF nanoparticles and films in EB lithography and patterning processes
* Studied gas permeation properties of EB modified MOF membranes
* Prepared ultrathin MOF films on Si and graphene surfaces for EB patterning application

**Sept. 2012 – Oct. 2018**

Graduate Research Assistant/Postdoctoral Fellow , *University of Illinois at Urbana-Champaign (UIUC), Urbana, IL*

Advisor: Prof. Kenneth S. Suslick

**Mechanochemistry of nanomaterials under static compression**

* Prepared metal oxide and MOF nanoparticles with tunable size and composition
* Developed methods for in situ TEM nanomechanical testing of nanoparticles

**Shockwave compression of MOF films**

* Prepared MOF composite films with controlled thickness and composition
* Analyzed morphological and chemical changes of MOF thin films after shock impact

**SKILLS**

* Microfabrication: PVD (sputtering, thermal evaporation), CVD (ALD), EB lithography, spin coating, plasma cleaning
* Material characterization: SEM, (S)TEM, EDS, FIB, AFM, profilometry, nanomechanical testing, XRD, UV-vis, NMR, TGA, gas sorption, ellipsometry

**PUBLICATIONS**

1. Corkery, P., Waltz, K. E., Eckhert, P. M., Ahmad, M., Kraetz, A., Miao, Y., Lee, D. T., Abdel-Rahman, M. K., Lan, Y., Haghi-Ashtiani, P., Stein, A., Boscoboinik, J. A., Tsapatsis, M. & Fairbrother, D. H. Zinc-Imidazolate Films as an All-Dry Resist Technology. Adv. Funct. Mater., 2311149 (2023).
2. Liu, Q., Miao, Y., Villalobos, L. F., Li, S., Babu, D. J., Chen, C., Chi, H.-Y., Vahdat, M. T., Hao, J., Song, S., Han, Y., Tsapatsis, M. & Agrawal, K. V. Nanometer-thick crystalline and amorphous zeolitic imidazolate framework films for membrane and patterning applications. Nat. Mater. 22, 1387-2393 (2023).
3. Xu, R., Peng, Y., Lu, P., Miao, Y., Duan, X., Lee, D. T., Wang, R., Wang, Z. & Tsapatsis, M. Twin suppression effect of dihydroxy-benzene isomers during the secondary growth of b-oriented zeolite MFI nanosheet films. CrystEngComm 25, 2359-2365 (2023).
4. Miao, Y., Lee, D. T., de Mello, M. D., Ahmad, M., Abdel-Rahman, M. K., Eckhert, P. M., Boscoboinik, J. A., Fairbrother, D. H. & Tsapatsis, M. Solvent-free bottom-up patterning of zeolitic imidazolate frameworks. Nat. Commun. 13, 420 (2022).
5. Gu, H., Lee, D. T., Corkery, P., Miao, Y., Kim, J. S., Yuan, Y., Xu, Z. l., Dai, G., Parsons, G. N. & Kevrekidis, I. G. Modeling of deposit formation in mesoporous substrates via atomic layer deposition: Insights from pore-scale simulation. AIChE J. 68, e17889 (2022).
6. Dorneles de Mello, M., Ahmad, M., Lee, D. T., Dimitrakellis, P., Miao, Y., Zheng, W., Nykypanchuk, D., Vlachos, D. G., Tsapatsis, M. & Boscoboinik, J. A. In Situ Tracking of Nonthermal Plasma Etching of ZIF-8 Films. ACS Appl. Mater. Interfaces 14, 19023-19030 (2022).
7. Miao, Y. & Tsapatsis, M. Electron Beam Patterning of Metal–Organic Frameworks. Chem. Mater. 33, 754-760 (2021).
8. Miao, Y., Lee, D. T., de Mello, M. D., Abdel-Rahman, M. K., Corkery, P., Boscoboinik, J. A., Fairbrother, D. H. & Tsapatsis, M. Electron beam induced modification of ZIF-8 membrane permeation properties. Chem. Commun. 57, 5250-5253 (2021).
9. Zhou, X., Miao, Y., Suslick, K. S. & Dlott, D. D. Mechanochemistry of metal–organic frameworks under pressure and shock. Acc. Chem. Res. 53, 2806-2815 (2020).
10. Zhou, X., Miao, Y.-R., Shaw, W. L., Suslick, K. S. & Dlott, D. D. Shock wave energy absorption in metal–organic framework. J. Am. Chem. Soc. 141, 2220-2223 (2019).
11. Miao, Y.-R. & Suslick, K. S. in Adv. Inorg. Chem. Vol. 71 403-434 (Academic Press, 2018).
12. Li, X., Shao, J., Kim, S.-K., Yao, C., Wang, J., Miao, Y.-R., Zheng, Q., Sun, P., Zhang, R. & Braun, P. V. High energy flexible supercapacitors formed via bottom-up infilling of gel electrolytes into thick porous electrodes. Nat. Commun. 9, 2578 (2018).
13. Su, Z., Shaw, W. L., Miao, Y.-R., You, S., Dlott, D. D. & Suslick, K. S. Shock wave chemistry in a metal–organic framework. J. Am. Chem. Soc. 139, 4619-4622 (2017).
14. Su, Z., Miao, Y.-R., Zhang, G., Miller, J. T. & Suslick, K. S. Bond breakage under pressure in a metal organic framework. Chem. Sci. 8, 8004-8011 (2017).
15. Moneypenny, T. P., Walter, N. P., Cai, Z., Miao, Y.-R., Gray, D. L., Hinman, J. J., Lee, S., Zhang, Y. & Moore, J. S. Impact of shape persistence on the porosity of molecular cages. J. Am. Chem. Soc. 139, 3259-3264 (2017).
16. Miao, Y.-R., Su, Z. & Suslick, K. S. Energy storage during compression of metal–organic frameworks. J. Am. Chem. Soc. 139, 4667-4670 (2017).
17. Su, Z., Miao, Y.-R., Mao, S.-M., Zhang, G.-H., Dillon, S., Miller, J. T. & Suslick, K. S. Compression-induced deformation of individual metal–organic framework microcrystals. J. Am. Chem. Soc. 137, 1750-1753 (2015).
18. Huang, H., Denard, C. A., Alamillo, R., Crisci, A. J., Miao, Y., Dumesic, J. A., Scott, S. L. & Zhao, H. Tandem catalytic conversion of glucose to 5-hydroxymethylfurfural with an immobilized enzyme and a solid acid. ACS Catal. 4, 2165-2168 (2014).
19. Ge, G.-W., Qi, Z.-Y., Miao, Y.-R., Du, H.-B. & You, X.-Z. The synthesis, structure and magnetism studies of two manganese sulfates with a 3D zeolite GIS framework and 1D chain structure. CrystEngComm 15, 435-438 (2013).

**AWARDS AND HONORS**

* T. S. Piper Award for outstanding graduate research *UIUC, 2017*
* University Merit Award *Nanjing, 2010*
* National Scholarship *Nanjing, 2009*

**TEACHING EXPERIENCE**

**2012 – 2014**

Teaching Assistant, *Dept. of Chemistry, University of Illinois at Urbana-Champaign*

* CHEM 512, Physical Methods in Inorganic Chemistry
* CHEM 103, General Chemistry Lab