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RESEARCH INTEREST

Quantum sensing; single-molecule microscopy and biophysics; protein dynamics; nuclear magnetic resonance (NMR) techniques; nitrogen-vacancy (NV) center in diamond; quantum material engineering

PROFESSIONAL APPOINTMENT

Assistant Professor, School of Molecular Sciences, Arizona State University, USA Starting 2023.12

- Principal Investigator leading the Experimental Quantum BioSensing (EQuBS) laboratory

Postdoctoral Scholar, Pritzker School of Molecular Engineering, the University of Chicago, USA 2019.4–present

Visiting Scientist, École polytechnique fédérale de Lausanne (EPFL), Switzerland 2019.4–9

- Quantum sensing based on NV in diamond; biophysics; quantum material engineering; nanoscale NMR
- Advisor: **Peter Maurer**; funded by Swiss NSF, U.S.-NSF, and U.S.-DoE

Postdoctoral Researcher, Dept. Chemistry and Biochemistry, The Ohio State University, USA 2018.10–2019.3

Graduate Research Associate, Dept. Chemistry and Biochemistry, The Ohio State University, USA 2014.1–2018.8

- Protein functional dynamics; biomolecule-nanoparticle interactions; NMR-based metabolomics
- Advisor: **Rafael Brüschweiler**; funded by U.S.-NSF and U.S.-NIH

EDUCATION

The Ohio State University, USA Ph.D. (Chemistry) 2018.8

Xiamen University, China, P.R. B.Sc. (Chemical Biology), graduation with highest honor 2013.6

PUBLICATIONS

(† Equal contribution)

- X. Guo, **M. Xie**[†], A. Addhya[†], A. Linder[†], U. Zvi, Y. Liu, I. N. Hammock, C. T. DeVault, Z. Li, A. Butcher, A. P. Esser-Kahn, D. D. Awschalom, N. Deegan, P. C. Maurer, F. J. Heremans, A. A. High. “Direct-bonded diamond membranes for heterogeneous quantum and electronic technologies”. *Submitted*. [arXiv:2306.04408](https://arxiv.org/abs/2306.04408)
- M. Xie**[†], X. Yu[†], L. V. H. Rodgers, D. Xu, I. Chi-Durán, A. Toros, N. Quack, N. P. de Leon, P. C. Maurer. “Biocompatible surface functionalization architecture for a diamond quantum sensor”. *Proc. Natl. Acad. Sci. U.S.A.* **2022**, 119, e2114186119.

[* Highlighted in *Nat. Rev. Mater.* “Quantum sensing goes bio” by Dr. Sadra Bakhshandeh]

- L. V. H. Rodgers, L. B. Hughes, **M. Xie**, P. C. Maurer, S. Kolkowitz, A. C. Bleszynski Jayich, N. P. de Leon. “Materials challenges for quantum technologies based on color centers in diamond” *MRS Bulletin*, **2021**, 46, 623.

11. S. Wardenfelt[†], X. Xiang[†], **M. Xie**[†], L. Yu, L. Bruschiweiler-Li & R. Brüschiweiler. “Broadband dynamics of ubiquitin by anionic and cationic nanoparticle-assisted NMR spin relaxation” *Angew. Chem. Int. Ed.*, **2021**, *60*, 148–152.
10. **M. Xie** [joined correspondence] & R. Brüschiweiler. “Degree of *N*-methylation of nucleosides and metabolites controls binding affinity to pristine silica surfaces” *J. Phys. Chem. Lett.*, **2020**, *11*, 10401.
9. D.-W. Li, **M. Xie** & R. Brüschiweiler. “Quantitative cooperative binding model for intrinsically disordered proteins interacting with nanomaterials” *J. Am. Chem. Soc.*, **2020**, *142*, 10730.
8. **M. Xie**[†], L. Yu[†], L. Bruschiweiler-Li, X. Xiang, A.L. Hansen & R. Brüschiweiler. “Functional protein dynamics on uncharted timescales detected by nanoparticle-assisted NMR spin relaxation” *Sci. Adv.*, **2019**, *5*, eaax5560.
7. **M. Xie**, D.-W. Li, J. Yuan, A.L. Hansen & R. Brüschiweiler. “Quantitative binding behavior of intrinsically disordered proteins to nanoparticle surfaces at individual residue level” *Chem.-Eur. J.* **2018**, *24*, 16997.
6. J. Yuan, C. Yuan, **M. Xie**, L. Yu, L. Bruschiweiler-Li & R. Brüschiweiler. “The intracellular loop of the Na⁺/Ca²⁺ exchanger contains an “awareness ribbon”-shaped two-helix bundle domain” *Biochemistry* **2018**, *57*, 5096.
5. B. Zhang, **M. Xie**, L. Bruschiweiler-Li & R. Brüschiweiler. “Nanoparticle-assisted metabolomics” *Metabolites* **2018**, *8*, 21.
4. **M. Xie**, A.L. Hansen, J. Yuan & R. Brüschiweiler. “Residue-specific interactions of an intrinsically disordered protein with silica nanoparticles and their quantitative prediction” *J. Phys. Chem. C* **2016**, *120*, 24463.
3. B. Zhang, **M. Xie**, L. Bruschiweiler-Li & R. Brüschiweiler. “Nanoparticle-assisted removal of protein in human serum for metabolomics studies” *Anal. Chem.* **2016**, *88*, 1003.
2. A.K. Bingol, L. Bruschiweiler-Li, D.-W. Li, B. Zhang, **M. Xie** & R. Brüschiweiler. “Emerging new strategies for successful metabolite identification in metabolomics” *Bioanalysis* **2016**, *8*, 557.
1. B. Zhang[†], **M. Xie**[†], L. Bruschiweiler-Li, A.K. Bingol & R. Brüschiweiler. “Use of charged nanoparticles in NMR-based metabolomics for spectral simplification and improved metabolite identification” *Anal. Chem.* **2015**, *87*, 7211.

PATENTS

1. WO2023288108A1. “Biocompatible surface for quantum sensing and methods thereof.” P.C. Maurer, M. Xie.

PRESENTATIONS

26. Gordon Research Conference/Seminar: Quantum Sensing, “*Biocompatible surface functionalization for bulk and membrane-based diamond quantum sensors (poster)*”, invited by Drs. Jean-Philippe Tetienne and Margarita Lesik as a Discussion Leader for GRS. Les Diablerets, VD, Switzerland, July 22-27, 2023.
25. Group Seminar, Dept. Chemistry at Technical University of Munich, invited by Prof. Dominik Bucher, “*Diamond-based quantum sensing for biophysics and molecular analytics*”. Munich, Germany, July 21, 2023.
24. Colloquium, Institute for Quantum Optics at Ulm University, invited by Prof. Fedor Jerezko, “*Diamond-based quantum sensing for molecular analytics*”. Ulm, Germany, July 20, 2023.
23. Colloquium, 3. Physikalisches Institut at University of Stuttgart, invited by Dr. Ruoming Peng and Prof. Jörg Wrachtrup, “*Diamond-based quantum sensing for molecular analytics*”. Stuttgart, Germany, July 19, 2023.

22. Departmental colloquium, Division of Science at New York University-Abu Dhabi, invited by Prof. Asif Equbal, "*Diamond-based quantum sensing for molecular analytics*". Abu Dhabi, the United Arab Emirates, April 3, 2023.
21. Departmental seminar, Dept. Chemistry at Zhejiang University, invited by Prof. Jiandong Feng, "*Diamond-based quantum sensing for molecular analytics*". Hangzhou, Zhejiang, China, March 22, 2023.
20. Departmental seminar, College of Chemistry & Chemical Engineering at Xiamen University, invited by Profs. Zhao-Xiong Xie and Jinhao Gao, "*Diamond-based quantum sensing for molecular analytics*". Xiamen, Fujian, China, March 20, 2023.
19. Departmental colloquium, Dept. Physics at HKUST, invited by Prof. Sen Yang, "*Diamond-based quantum sensing for molecular analytics*". Hong Kong SAR, China, March 16, 2023.
18. Departmental colloquium, Dept. Physics & Energy Science at University of Colorado-Colorado Springs, invited by Prof. Anatoliy Glushchenko, "*Diamond-based quantum sensing for biophysics*". Colorado Springs, CO, USA, March 6, 2023.
17. Departmental seminar, School of Medicine and Department of Physics, Washington University at St. Louis, invited by Profs. David Piston and David Kast, "*Diamond-based quantum sensing for molecular analytics*". St. Louis, MO, USA, February 28, 2023.
16. Departmental seminar, School of Molecular Sciences at Arizona State University, invited by Prof. Tijana Rajh, "*Diamond-based quantum sensing for molecular analytics*". Tempe, AZ, USA, February 2, 2023.
15. Departmental colloquium, Dept. Physics at Virginia Tech, invited by Profs. Shengfeng Cheng and Mark Pitt, "*Diamond-based quantum sensing for biophysics*". Blacksburg, VA, USA, January 27, 2023.
14. Group seminar, the University of Illinois Urbana-Champaign, invited by Prof. Mikael Backlund, "*Biocompatible surface functionalization architecture for a diamond quantum sensor*". Urbana, IL, USA, November 11, 2022.
13. The XXIXth International Conference on Magnetic Resonance in Biological Systems (ICMRBS), flash talk "*Quantum biosensing: surface functionalization is key*". Boston, MA, USA, August 21-25, 2022.
12. ACS Fall Meeting 2022, "*Biocompatible surface functionalization architecture for a diamond quantum sensor*". Chicago, IL, USA, August 22-26, 2022 (presented by Xiaofei Yu due to conflict with ICMRBS).
11. APS March Meeting 2022, "*Biocompatible surface functionalization architecture for a diamond quantum sensor*". Chicago, IL, USA, March 14-18, 2022.
10. Tutorial: Global NMR Discussion Meetings, invited by the organizing committee, "*Nanoparticle-assisted NMR spin relaxation*". Virtual, November 10, 2020.
9. Single-Molecule Sensors and NanoSystems International Conference 2020 (S3IC), invited by the organizing committee, "*Biocompatible diamond surface functionalization for single-molecule quantum sensing*". Barcelona, Spain (virtual), November 9-11, 2020.
8. Workshop: Diamond quantum metrology techniques for bio-sensing, invited by the organizing committee, "*Biocompatible diamond surface modification*". Chicago, IL, USA (virtual), September 28, 2020.
7. Research seminar, Institut de Biologie Structurale, invited by Prof. Martin Blackledge, "*Nanoparticle-assisted NMR spin relaxation in biophysics and metabolomics*". Grenoble, France, August 20, 2019.
6. Research seminar, Institute of Functional Genomics, Universität Regensburg, invited by Prof. Wolfram Gronwald, "*nanoparticle-assisted NMR-based metabolomics*". Regensburg, Germany, August 13, 2019.

5. Research seminar, Institute for Molecular Engineering, the University of Chicago, invited by Prof. Peter Maurer. Chicago, IL, USA, January 10, 2019.
4. National Renewable Energy Laboratory (NREL) – Biosciences Center, invited by Dr. Mark Davis. Golden, CO, USA, November 5, 2018.
3. The Walsworth group seminar, Harvard University Dept. Physics and Harvard-Smithsonian Center for Astrophysics, invited by Prof. Ronald Walsworth. Cambridge, MA, USA, August 9, 2018.
2. First Conference on Biomotors, Virus Assembly, and Nanobiotechnology Applications, invited by Prof. Peixuan Guo. Columbus, OH, USA, August 16-19, 2017.
1. Gordon Research Seminar: Computational Aspects – Biomolecular NMR, invited by Dr. Iva Pristisanac. Newry, ME, USA, June 10-11, 2017.

SELECTED AWARDS & HONORS

59 th ENC Student Travel Stipend Award	2018
First-Place in Oral Presentation at 10 th Cleveland State Interdisciplinary Research Conference	2016
International Genetically Engineered Machine Competition, Gold Medal (team)	2012
Fujian Province Outstanding Student (<0.65‰ students are awarded annually)	2012
CHINA PING'AN First-Class Encouragement Scholarship	2012
China National Scholarship (declined due to conflict with CHINA PING'AN)	2012
Xiamen University First-Class Scholarship	2012,13

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