Wendong Wang, Ph.D.

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PROFESSIONAL APPOINTMENTS

2020.10 – **Associate Professor**, University of Michigan – Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University, Shanghai, China

2020 – 2020.9 **Senior Research Scientist,** Department of Physical Intelligence, Max Planck Institute for Intelligent Systems, Stuttgart, Germany

2014 – 2019 **Postdoctoral Fellow,** Alexander von Humboldt Fellowship
Advisor: Prof. Metin Sitti

2011 – 2014 **Postdoctoral Fellow, Harvard University, USA**
School of Engineering and Applied Sciences
Wyss Institute for Biologically Inspired Engineering
Advisor: Prof. Joanna Aizenberg

EDUCATION

2006 – 2011 **Ph.D. Materials Chemistry, University of Toronto, Canada**
Advisor: Prof. Geoffrey Ozin, Dept. of Chemistry,
Co-advisor: Prof. Douglas Perovic, Dept. of Materials Science and Engineering
Dissertation: Periodic Mesoporous Silica and Organosilica

2002 – 2006 **B.Sc., Fundamental Sciences, Nanjing University, China**
Kuang Yaming Honors School

2004 **Funded Exchange Student, National University of Singapore, Singapore**

SELECTED AWARDS and HONORS

2017 European Research Stay Funded by Alexander von Humboldt Foundation
Department of Applied Mathematics and Theoretical Physics, Univ. of Cambridge
2015 – 2017 Alexander von Humboldt Fellowship for Postdoctoral Researcher
2006 – 2011 University of Toronto Fellowship
2005 Delegate for Forum for American and Chinese Exchange at Stanford
2003 – 2005 National Personnel Training Foundation in Fundamental Sciences Awards
2003 – 2005 Ren Ming Scholarship
2003 Guan Hua Scholarship
2001 – 2002 Chemistry Olympiad 1st place in provincial final and silver medal in the national final

CAREER SUMMARY AND RESEARCH INTERESTS

My education and training in fundamental and applied sciences have provided me with a solid foundation in chemistry and physics, particularly in areas related to materials sciences. In all my research, I have been trying to address important technological issues and study fundamental scientific questions at the same time. My current research interests lie at the intersection of materials synthesis/fabrication and non-equilibrium systems, including 4D printing, materials discovery through

machine learning, programmable self-assembly, nanofluidics, micro-robotics, and life-inspired dynamic and programmable material systems.

RESEARCH EXPERIENCES

2020 – **Senior Research Scientist, Max Planck Institute for Intelligent Systems**

2014 – 2019 **Postdoctoral Fellow, Max Planck Institute for Intelligent Systems**

- Designed and developed a dynamic and programmable materials system based on spinning micro-rafts at the air-water interface (*Sci. Adv.* 2017)
- Explored the collective navigation and object manipulation using spinning micro-rafts as a model collective system (*IROS* 2018)
- Assisted in developing an analytical model for the pairwise interactions of micro-rafts with Prof. Eric Lauga and Dr. Lyndon Koens at the University of Cambridge (*Soft Matter*, 2019)
- Discovered spatiotemporal patterns of the collective spinning micro-rafts that share similarities to the thermodynamic phases, constructed an information entropy to measure the information content in the collective phases, and probed the relationship between information and order (*submitted*)
- Mentored two master students in a project on 3D printing of materials with stiffness gradient with Prof. Achim Menges at Institute for Computational Design at University of Stuttgart and contributed to the design of the experiments and the materials characterization (*Sci. Adv.* 2020)

2011 – 2014 **Postdoctoral Fellow, Harvard University**

- Developed multifunctional magnetically-actuated microstructured surfaces to control adhesion and friction, transport and mix droplets, control droplet flows, pump liquid, transport colloids, and manipulate biofilms (US patent 2017; *Nature* 2018)
- Investigated anti-fouling membranes for wastewater treatment and for biofuel algae culturing
- Developed a technique to pattern wetting properties of mesoporous organosilica thin films as a potential technology for encryption and nanofluidics (*Can. J. Chem.-Rev. Can. Chim.* 2012)
- Wrote a grant proposal for a full-color high-speed camera and secured the funding from Dept. of Defense, USA
- Assisted in reviewing NIH grant proposals and journal manuscripts from Nature, Nature Chemistry, Nano Letters, Angewandte Chemie International Edition, Langmuir, and Applied Physics Letters.

2006 – 2011 **Graduate Student Researcher, University of Toronto, Toronto,**

- Developed EISA(evaporation-induced self-assembly)-based vacuum-assisted aerosol deposition, a vapor phase technique that produced thin films of periodic mesoporous organosilicas (PMOs) for use as low-dielectric-constant insulating materials in semiconductor microprocessors (*Adv. Mater.* 2010)
- Investigated the structure-property relationship of thin films of PMOs and successfully fine-tuned their hydrophobicity, porosity, dielectric constant, and Young's modulus to meet the need of next-generation dielectric insulating materials for the semiconductor industry (*ACS Nano* 2011)

- Co-invented a novel periodic mesoporous silica–graphene oxide sandwich composite with porous channels aligned vertically to the graphene sheet, and investigated its use as gas sensors (*ACS Nano* 2010)
- Co-invented a class of silicon nanocrystal embedded mesoporous organosilica, and investigated its thermal and chemical properties and its use as a multifunctional drug delivery system (*J. Am. Chem. Soc.* 2012)
- Co-invented a novel polyhedral oligomeric silsesquioxane (POSS) embedded mesoporous organosilica, and investigated its use as low-dielectric constant materials (*J. Am. Chem. Soc.* 2011)
- Co-invented periodic mesoporous hydridosilica, a material that formally considered impossible because of structural instability associated with three covalent connections (*J. Am. Chem. Soc.* 2011, highlighted in *Nat. Chem.*)

MENTORING EXPERIENCES

2014 – 2020 **Max Planck Institute for Intelligent Systems**

- Palak Harvani: Intern (coauthor in a submitted manuscript)
- Gaurav Gardi: Ph.D. student (co-first author in a submitted manuscript)
- Pedro Giachini and Sachin Gupta: master students from the Institute for Computational Design (ICD) at University of Stuttgart (one publication in *Science Advances*)

2011 – 2014 **Harvard University**

- Nick Perkons: senior-year thesis student (M.D. student at U. Penn.)
- Joshua Chi: undergraduate research student (master student at Johns Hopkins University, co-author in one publication, *Nature* 2018)
- Chris Plunkett: Research Experience for Undergraduates (REU) student

2006 – 2011 **University of Toronto**

- Min Guan: exchange graduate student from Lanzhou University (first author publication: *J. Am. Chem. Soc.* 2012)
- Ara Kim: co-op student from University of Waterloo (co-author in one publication, *Adv Mater.* 2011)
- Cindy Lin, Mengzhou Li: Undergraduate summer research students from the University of Toronto
- Nils-Olof Born: Diploma student from University of Mainz

TEACHING EXPERIENCES

2017 **Tutorial lecturer, Max Planck Institute for Intelligent Systems**

- Gave a lecture series based on Israelachvili's textbook Intermolecular and Surface Forces

2009 – 2010 **Tutorial lecturer, University of Toronto**

- 3 semesters for general chemistry class Chemistry: Physical Principles
  - Conducted tutorials for groups of 40-50 students, three times a week
  - Marked tutorial quizzes, term tests, and final exams
  - Provided extra help session before their term tests and final exams

2006 – 2008 **Laboratory Demonstrator, University of Toronto**

- 2 semesters for general chemistry class Chemistry: Physical Principles
- 3 semesters for organic chemistry class Introduction to Organic Chemistry I
  - Supervised their lab experiments for groups of 20 – 30 students once or twice per week, marked the lab reports, and invigilated the term tests

OUTREACH EXPERIENCES

05/2017	Presenter for a visitor group from Bosch foundation
07/2015	Presenter for visiting SUPER students/summer interns from University of Stuttgart
06/2015	Presenter for visiting undergraduate student group from University of Virginia
05/2014	Presenter at Cambridge 8th Grade Science and Engineering Showcase
04/2013	Presenter in NanoDay at Museum of Science, Boston
10/2012	Presenter in National Chemistry Week at Museum of Science, Boston
03/2013	Presenter in NanoDay at Museum of Science, Boston
05/2012	Presenter at Cambridge 8th Grade Science and Engineering Showcase
04/2012	Presenter at Science Week at Harvard University
04/2010	Blogger for Materials Research Society Spring Conference 2010
09/2007	Member in Team Chemistry of Habitat for Humanity

REPRESENTATIVE PUBLICATIONS

Wang, W. †, Gardi G. †, Kishore, V., Koens, L., Son, D., Gilbert, H., Harwani, P., Lauga, E., Sitti, M., Order and Information in the Phases of a Torque-driven Collective System, *submitted*. Link

Giochini. P.A. †; Gupta, S.S. †; **Wang, W.**; Wood, D.; Yunusa, M.; Baharlou, E.; Sitti, M.; Menges, A., Additive manufacturing of cellulose-based materials with continuous, multidirectional stiffness gradients. *Sci. Adv.* **6**, eaay0929 (2020). Link

Wang, W.†; Timonen J.†; Carlson, A.; Grinthal, A.; Kolle, S.; Wong, T.-S.; Hatton, B.; Carlson, A.; Kang, S. H.; Kennedy, S.; Chi, J.; Blough, R. T.; Mahadevan, L.; Aizenberg, J., Multiscale topographically-responsive ferrofluid-infused porous surfaces. *Nature* **559**, 77-82 (2018). Link

Wang, W., Giltinan, J., Zakharchenko, S. & Sitti, M. Dynamic and programmable self-assembly of micro-rafts at the air-water interface. *Sci. Adv.* **3**, e1602522 (2017). Link

Wang, W., Grozea, D., Kim, A., Perovic, D. D. & Ozin, G. A. Vacuum-assisted aerosol deposition of a low-dielectric-constant periodic mesoporous organosilica film. *Adv. Mater.* **22**, 99-102 (2010). Link

JOURNAL PUBLICATIONS

Google Scholar Page. ORCID ID: 0000-0003-3007-1750. Researcher ID: B-6163-2011

20. **Wang, W.** †, Gardi G. †, Kishore, V., Koens, L., Son, D., Gilbert, H., Harwani, P., Lauga, E., Sitti, M., Order and Information in the Phases of a Torque-driven Collective System, *submitted*. Link

19. Giltinan, J., Katsamba, P., **Wang, W.**, Lauga, E. & Sitti, M. Selectively Controlled Magnetic Microrobots with Multiple Helices. *Appl. Phys. Lett.,* **116**, 134101 (2020). Link

18. Giochini. P.A. †; Gupta, S.S. †; **Wang, W.**; Wood, D.; Yunusa, M.; Baharlou, E.; Sitti, M.; Menges, A., Additive manufacturing of cellulose-based materials with continuous, multidirectional stiffness gradients. *Sci. Adv.* **6**, eaay0929 (2020). Link

17. Koens, L.; **Wang, W.**; Sitti, M.; Lauga, E., The near and far of two magnetic capillary disks, *Soft Matter* **15**, 1497–1507 (2019). Link (Inside back cover)

16. **Wang, W.**†; Timonen J.†; Carlson, A.; Drotlef, D; Zhang, T.Y.C.; Grinthal, A.; Kolle, S.; Wong, T.-S.; Hatton, B.; Carlson, A.; Kang, S. H.; Kennedy, S.; Chi, J.; Blough, R. T.; Sitti, M.; Mahadevan, L.; Aizenberg, J., Multifunctional ferrofluid-infused surfaces with reconfigurable multiscale topography. *Nature* **559**, 77-82 (2018). Link

15. Wang, Z.-M.; Peng, W.; Takenaka, Y.; Yoshizawa, N.; Kosuge, K.; **Wang, W.**; Ozin, G.A., Sandwich-type nanocomposite of reduced graphene oxide and periodic mesoporous silica with vertically aligned mesochannels of tunable pore depth and size, *Adv. Funct. Mater*. **27**, 1704066, (2017). Link (Cover)

14. **Wang, W.**, Giltinan, J., Zakharchenko, S. & Sitti, M. Dynamic and programmable self-assembly of micro-rafts at the air-water interface. *Sci. Adv.* **3**, e1602522 (2017). Link

13. Qian, C., Sun, W., Wang, L., Chen, C., Liao, K., **Wang, W.**, Jia, J., Hatton, B. D., Casillas, G., Kurylowicz, M., Yip, C. M., Mastronardi, M. L. & Ozin, G. A. Non-wettable, oxidation-stable, brightly luminescent, perfluorodecyl-capped silicon nanocrystal film. *J. Am. Chem. Soc.* **136**, 15849-15852 (2014). Link

12. Wang, Z. M., Yoshizawa, N., Kosuge, K., **Wang, W.** & Ozin, G. A. Quiescent hydrothermal synthesis of reduced graphene oxide-periodic mesoporous silica sandwich nanocomposites with perpendicular mesochannel alignments. *Adsorpt.-J. Int. Adsorpt. Soc.* **20**, 267-274 (2014). Link

11. **Wang, W.**, Burgess, I. B., Hatton, B. D., Alvarenga, J. & Aizenberg, J. Secrets revealed - spatially selective wetting of plasma-patterned periodic mesoporous organosilica. *Can. J. Chem.-Rev. Can. Chim.* **90**, 1063-1068 (2012). Link (Invited)

10. Guan, M., **Wang, W.**, Henderson, E. J., Dag, O., Kubel, C., Chakravadhanula, V. S. K., Rinck, J., Moudrakovski, I. L., Thomson, J., McDowell, J., Powell, A. K., Zhang, H. X. & Ozin, G. A. Assembling photoluminescent silicon nanocrystals into periodic mesoporous organosilica. *J. Am. Chem. Soc.* **134**, 8439-8446 (2012). Link

9. **Wang, W.**, Faulkner, D., Moir, J. & Ozin, G. A. The effect of solvent in evaporation-induced self-assembly: A case study of benzene periodic mesoporous organosilica. *Sci. China-Chem.* **54**, 1920-1925 (2011). Link (Invited)

8. Seino, M., **Wang, W.**, Lofgreen, J. E., Puzzo, D. P., Manabe, T. & Ozin, G. A. Low-k periodic mesoporous organosilica with air walls: POSS-PMO. *J. Am. Chem. Soc.* **133**, 18082-18085 (2011). Link

7. Xie, Z. Y., Henderson, E. J., Dag, O., **Wang, W.**, Lofgreen, J. E., Kubel, C., Scherer, T., Brodersen, P. M., Gu, Z. Z. & Ozin, G. A. Periodic mesoporous hydridosilica - Synthesis of an "impossible" material and its thermal transformation into brightly photoluminescent periodic mesoporous nanocrystal silicon-silica composite. *J. Am. Chem. Soc.* **133**, 5094-5102 (2011). Link (Highlighted in Nature Chemistry May 2011 issue)

6. **Wang, W.**, Grozea, D., Kohli, S., Perovic, D. D. & Ozin, G. A. Water repellent periodic mesoporous organosilicas. *ACS Nano* **5**, 1267-1275 (2011). Link

5. Dag, O., Henderson, E. J., **Wang, W.**, Lofgreen, J. E., Petrov, S., Brodersen, P. M. & Ozin, G. A. Spatially confined redox chemistry in periodic mesoporous hydridosilica-nanosilver grown in reducing nanopores. *J. Am. Chem. Soc.* **133**, 17454-17462 (2011). Link

4. Wang, Z. M., **Wang, W.**, Coombs, N., Soheilnia, N. & Ozin, G. A. Graphene oxide-periodic mesoporous silica sandwich nanocomposites with vertically oriented channels. *ACS Nano* **4**, 7437-7450 (2010). Link

3. **Wang, W.**, Lofgreen, J. E. & Ozin, G. A. Why PMO? Towards functionality and utility of periodic mesoporous organosilicas. *Small* **6**, 2634-2642 (2010). Link (Front cover)

2. **Wang, W.**, Grozea, D., Kim, A., Perovic, D. D. & Ozin, G. A. Vacuum-assisted aerosol deposition of a low-dielectric-constant periodic mesoporous organosilica film. *Adv. Mater.* **22**, 99-102 (2010). Link

1. Hou, K., Puzzo, D., Helander, M. G., Lo, S. S., Bonifacio, L. D., **Wang, W.**, Lu, Z. H., Scholes, G. D. & Ozin, G. A. Dye-anchored mesoporous antimony-doped tin oxide electrochemiluminescence cell. *Adv. Mater.* **21**, 2492-2496 (2009). Link (Front cover)

PEER-REVIEWED CONFERENCE PROCEEDINGS

1. **Wang, W.***, Kishore, V., Koens, L., Lauga, E. & Sitti, M*. Collectives of Spinning Mobile Micro-robots for Navigation and Object Manipulation at the Air-water Interface in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* 1–9 (2018). Link and supporting videos.

PATENT

1. Aizenberg, J., Hatton, B., Yao, X., Aizenberg, M. & Wang, W. Dynamic and switchable slippery surfaces. US9683197B2 (2017).

INVITED PRESENTATIONS

Dynamic and Programmable Self-assembly of Spinning Micro-rafts at the Air-water Interface, *International Conference on Robotics and Automation (ICRA) 2020 Workshop on Self-Assembling and Reconfigurable Systems*, remote, Jul 2020

Dynamic Material Systems: FLIPS and Collective Microrobots, *Dept. of Mechanical and Energy Engineering*, *Southern University of Science and Technology*, Shenzhen, China, Jun 2019

Dynamic Material Systems: FLIPS and Collective Microrobots, *Department of Chemistry, University of Toronto*, Toronto, Canada, Aug. 2018

Dynamic Material Systems: FLIPS and Microrobots, *Leibnitz Institute for New Materials*, Saarbrücken, Germany, Aug. 2018

Dynamic and programmable self-assembly of micro-rafts at the air-water interface, *Dept. of Applied Mathematics and Theoretical Physics*, *Cambridge University*, Cambridge, UK, Mar. 2017

REVIEWER

Publons profile

Journal reviewer for *Science Advances*, *ACS Nano*, *ACS Applied Materials & Interfaces*, *Extreme Mechanics Letters*, *Entropy*, *Micromachines*, *The Canadian Journal of Chemical Engineering*, *Micromachines*

Conference proceeding reviewer for *IEEE International conference On Robotics and Automation*

Assisted in reviewing *NIH grant proposals, Nature, Nature Chemistry, Nano Letters, Angewandte Chemie International Edition, Langmuir, and Applied Physics Letters.*

Guest critic for Nano|Micro|Macro: Adaptive Material Laboraory Presentations in Graduate School of Design at Harvard, 2013. Reviewer for National Collegiate Research Conference 2014

PROFESSIONAL AFFILIATIONS

Materials Research Society, American Chemical Society

REFERENCES

Professor Geoffrey Ozin (Ph.D. advisor)
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