MUCHUN LIU, Ph.D.

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CURRENT POSITION

Massachusetts Institute of Technology — 08/2020 - Now

Postdoctoral Associate, Department of Civil and Environmental Engineering

Advisor: Prof. Benedetto Marelli

To develop biodegradable and biocompatible microcapsules for payload delivery.

To design sustainable nanomaterials for advanced applications.

EDUCATION

Brown University — 2020

Ph.D., Chemistry

Thesis: "2D nanochannels in textured graphene films – intercalated templating, nanofluidic transport and controlled release (link)". Advisor: Prof. Robert H. Hurt.

Beihang University — 2015

M.E., Materials Engineering

Beihang University — 2012

B.E., Materials Science and Engineering

RESEARCH EXPERIENCE

Brown University — 06/2020 - 07/2020

Postdoctoral Associate

Advisor: Prof. Robert H. Hurt, School of Engineering

Graduate Research Assistant, Ph.D. — 09/2015 - 05/2020

Advisor: Prof. Robert H. Hurt, School of Engineering

- Tilted nanochannels from horizontal to vertical to achieve mechanically stable graphene oxide membranes with reduced permeant path lengths.
- Studied the edge- and basal-plane specific controlled release behaviors from intercalated graphene oxide films and potential antiviral applications.
- Used graphene films as chemical and physical barriers for insects.
- Replicated hierarchical metal oxide topographies from textured graphene oxide by pre- and post-intercalation.
- Studied stretching, bending and magnetic properties of metal oxide wrinkled films.
- Prepared 1T phase MoS_2 and $MoSe_2$ textured films for antibacterial coating and drug delivery.

Beihang University — 09/2012 - 01/2015

Graduate Research Assistant, Master

Advisor: Prof. Yan Zhao, School of Materials Science and Engineering

- Synthesized $LiFePO_4$/graphene/C nanocomposites for high performance lithium-ion batteries cathode.

Undergraduate Research Assistant — 09/2008 - 06/2012

Advisor: Prof. Yan Zhao, School of Materials Science and Engineering

Co-advisor: Prof. Tong Zhao, Institute of Chemistry, Chinese Academy of Sciences

- Synthesized and studied aniline modified graphene and mechanical properties of its bismaleimide nanocomposites.

TEACHING EXPERIENCE

Mentor for Institute at Brown for Environment and Society - Leadership Alliance Program — 2020

	Graduate teaching assistant	2015 - 2016

AWARDS AND CERTIFICATES

"Special Mention" distinction in the competition for the 2021 Carbon Journal Prize. (An international competition for "an outstanding Ph.D. thesis in carbon materials science and technology".)	2021
MIT Kaufman Teaching Certificate Program	2020
Best Presentation Award at the MRS Fall Meeting, USA	2019
Finalist of Science as Art Competition at MRS Fall Meeting, USA	2019
National Graduate Scholarship (Beihang University)	2013

PROFESSIONAL SERVICES

Member of *Carbon*'s extended Advisory board	2021 - Now
Active reviewer for the following journals: *Carbon*, *Carbon Trends*, *iScience*.	2016 - Now
Volunteer for PFAS Drinking Water Sampling in Rhode Island	2019
Member of Graduate Student Leadership Committee	2018 - 2020
NIEHS Superfund Research Program trainee	2016 - 2020

PUBLICATION LIST

Citation Summary (09/07/2021): Citations: 536; h-index: 11; i10-index: 11

1. M Liu, B Marelli. Tunable structure of biodegradable silk-based microcapsules for soluble and insoluble payload delivery. *Submitted*, 2021.
2. M Liu, DCC Fernandes, ZSSL Saleeba, RH Hurt. Controlled release of molecular intercalants from two-dimensional nanosheet films. *Submitted*, 2021.
3. M Liu, PJ Weston, RH Hurt. Controlling nanochannel orientation and dimensions in graphene-based nanofluidic membranes. *Nat. Commun.*, 2021, 12, 507. (This article is featured in the Editors' Highlights section of the *Nature Communications* website and is featured in the news story Rotated graphene stacks up for better membranes in *Nano Today*'s April issue.)
4. M Liu, L Qian, C Yu, G Xiao, RH Hurt. Stretching, bending and magnetic properties of cobalt ferrite wrinkled films. *Nanoscale Adv.*, 2021, 3, 800-804.
5. Y Kwon, M Liu, CJ Castilho, Z Saleeba, R Hurt, I Külaots. Controlling pore structure and conductivity in graphene nanosheet films through partial thermal exfoliation. *Carbon*, 2021, 174, 227-239.
6. EP Gray, CL Browning, CA Vaslet, KD Gion, A Green, M Liu, AB Kane, RH Hurt. Chemical and colloidal dynamics of MnO_2 nanosheets in biological media relevant for nanosafety assessment. *Small*, 2020, 2000303.
7. CJ Castilho, D Li, M Liu, Y Liu, H Gao, RH Hurt. Mosquito bite prevention through graphene barrier layers. *Proc. Natl. Acad. Sci.*, 2019, 116, 18304-18309.
8. TM Valentin, AK Landauer, LC Morales, EM DuBois, S Shukla, M Liu, et al. Alginate-graphene oxide hydrogels with enhanced ionic tunability and chemomechanical stability for light-directed 3D printing. *Carbon*, 2019, 143, 447-456.
9. M Liu, PY Chen, RH Hurt. Graphene inks as versatile templates for printing tiled metal oxide crystalline films. *Adv. Mater.*, 2018, 30, 1705080.
10. M Liu, CJ Castilho, RH Hurt. New material architectures through graphene nanosheet assembly. *Adv. Mater. Lett.*, 2018, 9, 843-850.
11. PY Chen, M Zhang, M Liu, IY Wong, RH Hurt. Ultrastretchable graphene-based molecular barriers for chemical protection, detection, and actuation. *ACS Nano*, 2017, 12, 234-244.
12. PY Chen, M Liu, Z Wang, RH Hurt, IY Wong. From flatland to spaceland: higher dimensional patterning with two-dimensional materials. *Adv. Mater.*, 2017, 29, 1605096.
13. Z Wang, YJ Zhang, M Liu, A Peterson, RH Hurt. Oxidation suppression during hydrothermal phase reversion allows synthesis of monolayer semiconducting MoS_2 in stable aqueous suspension. *Nanoscale*, 2017, 9, 5398-5403.
14. P Chen, M Liu, TM Valentin, Z Wang, RS Steinberg, J Sodhi, IY Wong, RH Hurt. Hierarchical metal oxide topographies replicated from highly textured graphene oxide by intercalation templating. *ACS Nano*, 2016, 10, 10869-10879.

15. M Liu, Y Zhao, S Gao, Y Wang, Y Duan, X Han, Q Dong. Mild solution synthesis of graphene loaded with $LiFePO_4$-C nanoplatelets for high performance lithium ion batteries. *New J. Chem*., **2015**, 39, 1094-1100.
16. M Liu, Y Duan, Y Wang, Y Zhao. Diazonium functionalization of graphene nanosheets and impact response of aniline modified graphene/bismaleimide nanocomposites. *Mater. Des*., **2014**, 53, 466-474.
17. Y Wang, Y Zhao, J Yin, M Liu, Q Dong, Y Su. Synthesis and electrocatalytic alcohol oxidation performance of Pd-Co bimetallic nanoparticles supported on graphene. *Int. J. Hydrog. Energy*, **2014**, 39, 1325-1335.
18. Q Dong, Y Zhao, X Han, Y Wang, M Liu, Y Li. Pd/Cu bimetallic nanoparticles supported on graphene nanosheets: Facile synthesis and application as novel electrocatalyst for ethanol oxidation in alkaline media. *Int. J. Hydrog. Energy*, **2014**, 39, 14669-14679.

CONFERENCES

1. "Realigning nanochannels in conventional graphene oxide films to achieve enhanced permeability and controlled release"
   MRS Fall National Meeting, Boston, MA, 2019.
2. "Realigning nanochannels in conventional graphene oxide films to achieve enhanced permeability and controlled release"
   Sustainable Nanotechnology Organization Conference, San Diego, CA, 2019.
3. "Graphene inks as versatile templates for printing tiled metal oxide crystalline films"
   256th ACS Fall National Meeting, Boston, MA, 2018.
4. "Tessellated platelet-crystal metal oxide topographies by graphene ink templating"
   The World Carbon Conference, Melbourne, Australia, 2017.
5. "Graphene inks as versatile templates for printing tiled metal oxide crystalline films"
   MRS Fall National Meeting, Boston, MA, 2017.
6. "Ultrastretchable graphene-based molecular barriers for chemical protection, detection, and actuation"
   NIEHS Superfund Research Program Annual Meeting, Philadelphia, PA, 2017.
7. "Mild solution synthesis of graphene wrapped $LiFePO_4$/C disc-shaped nanoparticles for lithium ion batteries"
   NT14: The Fifteenth International Conference on the Science and Application of Nanotubes, Los Angeles, CA, 2014.
8. "Study on mechanical properties of modified graphene/epoxy nanocomposites"
   The 19th International Conference on Composite Materials, Montréal, Canada, 2013.