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Education

Ph. D.

Department of Biomedical Engineering and Environmental Science, National Tsing Hua University (NTHU), Taiwan. (Supervisor: Professor Shang-Hsiu Hu)

M.S.

Institute of Polymer Science and Engineering, National Taiwan University (NTU), Taiwan. (Supervisor: Professor Jien-Jen Lin)

B.S.

Department of Chemistry, National Kaohsiung Normal University (NKNU), Taiwan.

Work Experience

Postdoctoral Scholar

(July 1, 2021 – now)

Department of Ophthalmology, Stanford University, USA. (P.I: Prof. Y. Joyce Liao)

Department of Chemistry, Stanford University, USA. (P.I.: Prof. Hongjie Dai)

Chemistry Teacher

(Sept. 1, 2012 – Feb. 1, 2021)

Municipal Chung-Shan Senior High School, Kaohsiung, Taiwan.

Teaching Assistant

(Sept. 1, 2016 – June 30, 2017)

Biomedical Engineering and Environmental Science, National Tsing Hua University, Hsinchu, Taiwan.

Major Research Experience

1. Polymer synthesis and biomaterial design for tissue regeneration.
2. Nano-medicine for controlled drug release system.
3. Droplet-based microfluidic system.
4. Fluorescence imaging in NIR II ($> \sim 1500\text{nm}$) for deep tissue and real-time diagnosis.
5. Animal model: Peripheral nerve injury, Trauma brain injury, Anterior ischemic optic neuropathy.

Mentoring Experience

❖ Stanford University

I mentored an undergraduate student, a post-graduate student, a medical student, and a visiting scholar by training them on experimental skills, data analysis, experimental design, and manuscript writing.

❖ NTHU

I Mentored 6 graduate students, 5 undergraduate students. I trained them on experimental skills and supervised them on data analysis and writing. All my undergraduate mentees went for higher education and the graduate mentees were recruited to R&D positions in industry



Awards and Scholarship

1. 2023 SPARK Translational Pilot Grant Award, Stanford University, U.S.A. (50,000 USD/year)
2. 2022 Bio-X Travel Award, Stanford University, U.S.A.
3. 2022 Emerging Scholar Award of Society for Biomaterials (SFB-JSB), U.S.A.
4. 2021 Member of the Phi Tau Phi Scholastic Honor Society of the Republic of China, Taiwan.
5. 2021 Fellowship of Postdoctoral Research of Ministry of Science and Technology, Taiwan. (40,000 USD/year) 科技部博士後千里馬
6. 2022 International Inventor Prize (IIP), Taiwan. 國際發明獎章
7. 2020 Excellent Dissertation Award of TienTe Lee Biomedical Foundation, Taiwan. (20,0000 NTD) 李天德基金會最佳論文獎
8. 2019 16th National innovation Award, Taiwan. 國家新創獎 (學研新創組)
9. 2018 1ST Outstanding Oral Award, International Advanced Drug delivery symposium and annual meeting of Biomaterials and Controlled Release Society, Taiwan.
10. 2018 Silver Medal Award, Poster Competition of 8th International Advanced Drug Delivery symposium, Taiwan.
11. 2017 Gold Medal Award, Poster Competition of the 6th International Conference on Bio-based Polymers.
12. 2017 Best Poster Awardees, 28th Annual Conference of the European Society for Biomaterials, Greece. (3/501)
13. 2017 Excellent Dissertation Award of NTHU, 2017, Hsinchu, Taiwan.
14. 2017 Best Poster Awardees, Poster Competition, College of Nuclear Science of NTHU.
15. 2017 Excellent Dissertation Award, The 7th WACBE World Congress in Bioengineering.
16. 2016 Best Poster Awardees, Poster Competition, College of Nuclear Science of NTHU.
17. 2016 Presidential Scholarship (4-years) of NTHU.
18. 2011 Nominated for Eni Award in Energy and Environment, 2011.

Publications

1. **R. S. Hsu**, S. Modgil, A. Kumar, Y.P. Liao*. " Topical application of 15-PGDH inhibitor encapsulated by nanomicelle rescues vision loss for Anterior ischemic optic neuropathy " (manuscript in preparation)
2. A. Baghdasaryan, H.R Liu, F.Q Ren, **R. S. Hsu**, Y.Y. Jiang, F.F Wang, M.Z. Zhang, L. Grigoryan, H.J. Dai*. Intratumor injected Gold Molecular Clusters for NIR-II Imaging and Cancer Therapy. *P.N.A.S.*, **2024**, 121 (5) e2318265121. (IF=12.78)
3. M. R. Chiang, Y. H. Lin, W. J. Zhao, H. C. Liu, **R. S. Hsu**, T. C. Chou, T. T. Lu, I. C. Lee, L. D. Liao, S. H. Chiou, L. A. Chu*, S. H. Hu*. In Situ Forming of Nitric Oxide and Electric Stimulus for Nerve Therapy by Wireless Chargeable Gold Yarn-Dynamos. *Advanced Science*, **2023**, 10, 2303566. (IF=15.1)
4. H. C. Liu, C. H. Huang, M. R. Chiang, **R. S. Hsu**, T. C. Chou, T. T. Lu, I. C. Lee, L. D. Liao, S. H. Chou, Z. H. Lin, S.H Hu*. Sustained Release of Nitric Oxide-Mediated Angiogenesis and Nerve Repair by Mussel-Inspired Adaptable Microreservoirs for Brain Traumatic Injury Therapy. *Advanced Healthcare Materials*, **2023**, 2302315. (IF=11.092)
5. F.Q Ren, F.F Wang, A. Baghdasaryan, Y.T Zhong, F. Salazar, Y. Li, C. Xu, **R.S. Hsu**, Y.Y. Jiang, H.R Liu, Z.R. Ma, J.C. Li, G.Z. Zhu, K.K. Wong, R. Willis, E. Mellins, A. Wu, and H.J. Dai*. Shortwave-infrared-light-emitting probes for the in vivo tracking of cancer vaccines elicited immune (accepted by *Nature Biomedical Engineering*, **2023**, IF=29.23)
6. Y.C. Chan, Y.H. Lin, H.C. Liu, **R.S. Hsu**, M.R. Chiang, L.W. Wang, T.T. Lu, I.C Lee, L.A. Chua, S.H Hu*. In Situ Magnetoelectric Generation of Nitric Oxide and Electric Stimulus for Nerve Therapy by Wireless Chargeable Molybdenum Carbide Octahedrons. *Nano Today*, **2023**, D23-00058. (IF=18.96)
7. **R. S. Hsu**, S. J. Li, J. H. Fang, C. W. Chen, I. J. Lee, Y. J. Lu, Y. Y. Chen, S. H. Hu*, Wireless Charging-Mediated



- Angiogenesis and Nerve Repair by Adaptable Microporous Hydrogels from Conductive Building Blocks. (*Nature communication*, 2022, 13,5172. (IF=17.8) **Awarded by Emerging Scholar Award of Society for Biomaterials (SFB-JSB), U.S.A., 2022.**
8. F. F. Wang, F. Q. Ren, L. Q. Qu, A. Baghdasaryan, **R. S. Hsu**, P. Liang, J. C. Li, G. Z. Zhu, Z. R. Ma, H. J. Dai*, High Precision Tumor Resection Down to Few-Cell Level Guided by NIR-IIb Molecular Fluorescence Imaging. *P.N.A.S.*, 2022, 119 (15) e2123111119. (**Equal contribution**, IF=12.78)
 9. W. T. Shen, **R. S. Hsu**, J. H. Fang, P. F. Hu, C. S. Chiang, S. H. Hu*, Marginative Delivery-Mediated Extracellular Leakiness and T Cell Infiltration in Lung Metastasis by Biomimetic Nano-Raspberry, *Nano Letters*, 2021, 21, 1375–1383. (IF= 11.19). **Journal Cover**
 10. J. H. Fang, H. H. Hsu, **R. S. Hsu**, C. K. Peng, Y. J. Lu, Y. Y. Chen, S. Y. Chen, S. H. Hu*, 4D Printing of Stretchable Nanocookie@Conduit Hosting Biocues and Magneto-Electrical Stimulation for Neurite Sprouting. *NPG Asia Materials*, 2020. (IF=10.99)
 11. J. H. Fang, C. H. Liu, **R. S. Hsu**, Y. Y. Chen, W. H. Chiang, H. M. D. Wang, S. H. Hu*, Transdermal Composite Microneedle Composed of Mesoporous Iron Oxide Nanoraspberry and PVA for Androgenetic Alopecia Treatment. *Polymers*, 2020, 12, 1392. (IF=4.329)
 12. **R. S. Hsu**, J. H. Fang, W. T. Shen, Y. C. Sheu, C. K. Su, S. H. Hu*, Injectable DNA-Architected Nano-Raspberry Depot-Mediated On-Demand Programmable Refilling and Release Drug Delivery. *Nanoscale*, 2020, 12, 11153. (IF=8.307)
 13. **R. S. Hsu**, P. Y. Chen, J. H. Fang, Y. Y. Chen, C. W. Chang, Y. J. Lu*, S. H. Hu*, Adaptable Microporous Hydrogels of Propagating NGF-Gradient by Injectable Building Blocks for accelerated Axonal Outgrowth, *Advanced Science*, 2019, 6, 1900520. (IF=17.52) **Awarded by 2019 National Innovation Award & Excellent Dissertation Award of TienTe Lee Biomedical Foundation, 2020.**
 14. Y. L. Su, K. T. Chen, Y. C. Sheu, S. Y. Sung, **R. S. Hsu**, C. S. Chiang, S. H. Hu*, The Penetrated Delivery of Drug and Energy to Tumors by Lipo-Graphene Nanosponges for Photolytic Therapy, *ACS Nano*, 2016, 10, 9420. (IF=18.03)
 15. J. Y. Chiou, **R. S. Hsu**, C. W. Chiu, and J. J. Lin, A Stepwise Mechanism for Intercalating Hydrophobic Organics into Multilayered Clay Nanostructures, *RSC Advances*, 2013, 3, 12847–12854. (IF=4.036)
 16. **R. S. Hsu**, W. H. Chang, and J. J. Lin, Nanohybrids of Magnetic Iron-Oxide Particles in Hydrophobic Organoclay for Oil Recovery. *ACS Applied Material & Interfaces*, 2010, 2, 1349–1354. (IF=9.229) **Nominated for 2011 Eni Award.**
 17. Y. N. Chan, **R. S. Hsu**, and J. J. Lin, Mechanism of Silicate Platelet Self-Organization During Clay-Initiated Epoxy Polymerization, *Journal of Physical Chemistry C*, 2010, 114, 10373–10378. (IF=4.814)
 18. Y. M. Chen, **R. S. Hsu**, H. C. Lin, S. J. Chang, S. C. Chen, and J. J. Lin, Synthesis of Acrylic Copolymers Consisting of Multiple Amine Pendants for Dispersing Pigment. *Journal of Colloid and Interface Science*, 2009, 334, 42–49. (IF=4.233)
 19. Y. M. Chen, H. C. Lin, **R. S. Hsu**, B. Z. Hsieh, Y. A. Su, Y. J. Sheng, J. J. Lin*, Thermoresponsive Dual-Phase Transition and 3D Self-Assembly of Poly (N-Isopropylacrylamide) Tethered to Silicate Platelets, *Chemistry of Materials*, 2009, 21, 4071–4079. (IF=9.466)
 20. J. J. Lin, Y. M. Chen, **R. S. Hsu**, *Journal of Chinese Institute of Engineers*, 2008, 81, 6, 26.

Patents

1. Y.P. Liao, **R.S. Hsu**, A. Kumar, S. Modgil, Composition and methods for treatment of vision loss using modulation of 15-PGDH activity (filed to the disclosure at Stanford University, U.S.A)
2. S. H. Hu, **R. S. Hsu**, Injectable and shearing-thinning microbeads gel, use thereof, and method for preparing the same (US Patent, 11,311,481)
3. S. H. Hu, **R. S. Hsu**, 可注射型自組裝微球凝膠、其用途及可注射型自組裝微球凝膠的製備方法. Oct, 1, 2019. (China Patent, 5015877)



4. S. H. Hu, **R. S. Hsu**, 可注射型自組裝微球凝膠、其用途及可注射型自組裝微球凝膠的製備方法. Oct, 1, 2019. (Taiwan Patent, I673103)
5. J. J. Lin, **R. S. Hsu**, Method for Collecting Oil with Modified Clay. (US Patent, 8647513)
6. J. J. Lin, **R. S. Hsu**, Method for Collecting Oil with Modified Clay. (Taiwan patent, I440704)

Invited Talks

1. How is nerve regeneration possible via Nano/Micro-engineered Biomaterials? From Lab Discovery to Clinical Application. (Nov. 9, **2023**. Department of Biomedical Engineering, National Yang Ming Chiao Tung University)
2. Application of biomaterials to tissue regeneration. (April 27, **2022**. Department of Engineering and System Science, National Tsing Hua University)
3. Wireless Charging-Mediated Angiogenesis and Nerve Repair by Adaptable Microporous Hydrogels from Conductive Building Blocks (Nov. 15, **2021**. Nanomedicine of I.E.E.E.)
4. Designing an Injectable & Adaptable Microporous Hydrogel for Peripheral Nerve Injury and Trauma Brain Injury. (June 12, **2021**. Department of Biomedical Science and Engineering, National Central University)
5. My journey of inspiration and perspiration. (May 19, **2021**. Department of Biological Science and Technology, National Chiao Tung University)
6. Injectable Isoelectric MicroBead-Gels with Swiftly Controllable Continuous Pores for Biomedical Application & 2019 National Innovation Award. (Nov. 18, **2019**, Craniofacial of Chang Gung Memorial Hospital)
7. Adaptable Microporous Hydrogels of Propagating NGF-Gradient by Injectable Building Blocks for Accelerated Axonal Outgrowth. (Nov. 12, **2019**, Center of Tissue Engineering of Chang Gung Memorial Hospital)
8. Directly Accelerated Axonal Outgrowth by injectable NGF-Gradient Microporous Scaffold Assembled from Charged Microgel Building Blocks. (June, 3, **2017**, Center of Tissue Engineering of Chang Gung Memorial Hospital)

Conference Papers

1. Wireless Charging-Mediated Angiogenesis and Nerve Repair by Adaptable Microporous Hydrogels from Conductive Building Blocks. **(Oral)** Society for biomaterial /Japanese Society for Biomaterials Joint Symposium, **2022**. (Hawaii, U.S.A) **SFB Emerging Scholar Award**.
2. Adaptable Microporous Hydrogels of Propagating NGF-Gradient by Injectable Building Blocks for Accelerated Axonal Outgrowth. **(Poster)** Workshop of Center of Minimally Invasive Therapeutics in UCLA, **2019**. (Los Angeles, U.S.A) **Selected for Nanoscribe scholarship**.
3. Adaptable Microporous Hydrogels of Propagating NGF-Gradient by Injectable Building Blocks for Accelerated Axonal Outgrowth. **(Oral)** International Advanced Drug Delivery symposium and annual meeting of Biomaterials and Controlled Release Society, **2018**. (Hsinchu, Taiwan) **Outstanding oral award**.
4. Self-assembled and Injectable Microporous Scaffold from NGF Gradient Hydrogel as a Synthetic Nerve Conduit for Peripheral Nerve Regeneration. **(Poster)** 8th Annual Conference of the European Society for Biomaterials, 2017. (Athens, Greece) **Best poster awardee (3/501)**.

Reference

1. Prof. Hongjie Dai, Department of Chemistry, Stanford University, USA. (hdai1@stanford.edu)/ Department of Chemistry, Hongkong University, China. (hdai@hku.hk)
2. Prof. Yaping Joyce Liao, School of Medicine, Stanford University, USA. (yiliao@stanford.edu)



3. Prof. Shang-Hsiu Hu, Department of Biomedical Engineering and Environmental Sciences, National Tsing Hua University, Taiwan (shhu@mx.nthu.edu.tw)
4. Prof. Chien-Wen Chang, Department of Biomedical Engineering and Environmental Sciences, National Tsing Hua University, Taiwan (chienwen@mx.nthu.edu.tw)
5. Prof. You-Yin Chen, Department of Biomedical Engineering, National Yang-Ming University, Taiwan (youyin.chen@ym.edu.tw)