Chao Zhuang, Ph.D.

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Education

2020 – 2023 **Ph.D. in Materials Science & Engineering**, University of Tsukuba, Tsukuba, Japan.

2016 – 2019 **Master in Microelectronics & Solid State Electronics**, Sun Yat-sen University, Guangzhou, China.

2012 – 2016 **Bachelor in Materials Physics**, Sun Yat-sen University, Guangzhou, China.

Research Experience

2020 – 2023 **Ph.D. Candidate** with Prof. Genki Yoshikawa, Materials Science & Engineering
National Institute for Materials Science (NIMS), Tsukuba, Japan

- Developed a Physical Vapor Deposition (PVD) protocol to fine-tune a MEMS sensor via mechanical nonlinearity, leading to a six-fold enhancement in performance.
- Constructed density-based topology optimization models to explore efficient MEMS sensor designs, discovering efficient designs with 30% sensitivity improvement.
- Conducted nonlinear mechanical analysis and Fluid-Structure Interaction (FSI) simulations for the development of a novel microfluidic device.

2016 – 2019 **Graduate Student** with Prof. Huanjun Chen, Microelectronics & Solid State Electronics
Sun Yat-sen University, Guangzhou, China

- Synthesized metal nanoparticles and exploited their optical properties using Raman spectroscopy, enabling in-vivo sensing applications in the near-infrared window.
- Investigated metal nanoparticles' plasmonic properties through Finite Element Analysis (FEA) and the finite-difference time-domain (FDTD) method.

Publications

Journal Articles

1. K. Shiba, **C. Zhuang**, K. Minami, G. Imamura, R. Tamura, S. Samitsu, T. Idei, G. Yoshikawa, L. Sun, and D. A. Weitz, "Visualization of Flow-Induced Strain Using Structural Color in Channel-Free Polydimethylsiloxane Devices", Adv. Sci. **10**, 2204310 (2023).
2. **C. Zhuang**, K. Minami, K. Shiba, and G. Yoshikawa, "Linear Stiffness Tuning in MEMS Devices via Prestress Introduced by TiN Thin Films", ACS Appl. Eng. Mater. **1**, 1213–1219 (2023).
3. **C. Zhuang**, K. Minami, K. Shiba, and G. Yoshikawa, "Tailoring Stresses in Piezoresistive Microcantilevers for Enhanced Surface Stress Sensing: Insights from Topology Optimization", 10.48550/arXiv.2308.11143 (2023), preprint.
4. **C. Zhuang**, K. Minami, K. Shiba, and G. Yoshikawa, "Topology optimization for piezoresistive nanomechanical surface stress sensors in anisotropic ⟨111⟩ orientations", Nano Express **4**, 035007 (2023).
5. **C. Zhuang**, K. Minami, K. Shiba, and G. Yoshikawa, "Topology optimization of piezoresistive nanomechanical sensors with integrated readout for enhanced surface stress sensing", Submitted for Publication (2023).

6. Y. Xu, B. Zhou, **C. Zhuang**, J. Zhou, H. Chen, and S. Deng, "High-Aspect-Ratio Plasmonic Heterostructures for In Vivo Enhanced Optical Coherence Tomography Imaging in the Second Near-Infrared Biological Window", Adv. Opt. Mater. **8**, 2000384 (2020).
7. Y. Shen, H. Chen, N. Xu, Y. Xing, H. Wang, R. Zhan, L. Gong, J. Wen, **C. Zhuang**, X. Chen, X. Wang, Y. Zhang, F. Liu, J. Chen, J. She, and S. Deng, "A Plasmon-Mediated Electron Emission Process", ACS Nano **13**, 1977–1989 (2019).
8. **C. Zhuang**, Y. Xu, N. Xu, J. Wen, H. Chen, and S. Deng, "Plasmonic Sensing Characteristics of Gold Nanorods with Large Aspect Ratios", Sensors **18**, 3458 (2018).
9. J. Wen, H. Wang, W. Wang, Z. Deng, **C. Zhuang**, Y. Zhang, F. Liu, J. She, J. Chen, H. Chen, S. Deng, and N. Xu, "Room-Temperature Strong Light–Matter Interaction with Active Control in Single Plasmonic Nanorod Coupled with Two-Dimensional Atomic Crystals", Nano Lett. **17**, 4689–4697 (2017).

Skills

Languages	Proficient in English, Mandarin Chinese, Cantonese Chinese, and Japanese; Beginner in French.
Computer Skills	COMSOL, OpenFOAM, MATLAB, Python, R, Mathematica, LaTeX, FDTD
Technical Skills	Design of Experiments, Mechanical Testing, Stylus Profilometer, Confocal Microscopy, Nanoindentation, Raman Spectroscopy, UV-vis Spectroscopy, Dark-field Spectroscopy, SEM/EDS, PVD, TEM

Academic Experience

Conferences

2023 **MSS Partnership**, Poster Presentation.

The 2nd Workshop on MSS Science & Technology, Online Presentation.

2022 **NIMS WEEK**, Conference Attendance.

Awards and Achievements

Excellent Presentation Award in NIMS Student Joint Conference, Issued by NIMS Global Program Office.

Certifications

2023 **Experimentation for Improvement**. Awarded by Coursera.

Japanese Language Proficiency Test N1. Awarded by the Japan Foundation.

2018 **TOEFL iBT**. Awarded by ETS.

References

Prof. Genki Yoshikawa
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University of Tsukuba
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Senior Researcher, Colleague
National Institute for Materials Science
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