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, University of Tsukuba, Tsukuba, Japan
Junior Researcher, National Institute for Materials Science (NIMS), Tsukuba, Japan

- Developed a Physical Vapor Deposition (PVD) protocol to fine-tune a MEMS sensor via mechanical nonlinearity, enabling zero stiffness and bistability for advanced sensing applications.
- Constructed density-based topology optimization models to explore efficient MEMS sensor designs, discovering efficient designs with 30% sensitivity improvement.
- Conducted Fluid-Structure Interaction (FSI) simulations to support the development of a PDMS-based microfluidic flow-sensing 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.

Skills

Languages — Proficient in English, Mandarin, Cantonese, and Japanese; Beginner in French.

Computer Skills — COMSOL, OpenFOAM, MATLAB, Python, R, Mathematica, LaTeX, FDTD

Technical Skills — Design of Experiments, Nanoindenter, Stylus Profilometer, Confocal Microscopy, Nanoindentation, Raman Spectroscopy, FTIR, UV-vis Spectroscopy, Dark-field Spectroscopy, SEM/EDS, PVD, TEM

Academic Experience

Awards and Achievements

2022 **Excellent Presentation Award in NIMS Student Joint Conference**, Issued by NIMS Global Program Office.

Conferences

2023 **MSS Partnership**, Poster Presentation.

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

2022 **NIMS WEEK**, Conference Attendance.

Academic Experience (continued)

Certifications

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

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

2018 **TOEFL iBT, 103/120**. Awarded by ETS.

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", *Advanced Science* **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 Applied Engineering Materials* **1**, 1213–1219 (2023).
3. **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).
4. 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", *Advanced Optical Materials* **8**, 2000384 (2020).
5. 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).
6. **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).
7. 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 Letters* **17**, 4689–4697 (2017).

Preprint

1. **C. Zhuang***, K. Minami, K. Shiba, and G. Yoshikawa*, "Tailoring Stresses in Piezoresistive Microcantilevers for Enhanced Surface Stress Sensing: Insights from Topology Optimization", in (arXiv e-prints, Aug. 1, 2023), preprint.

In Preparation

1. **C. Zhuang***, K. Minami, K. Shiba, and G. Yoshikawa*, "Topology optimization of piezoresistive nanomechanical sensors with integrated readout for enhanced surface stress sensing", (2023).

References

Prof. Dr. Genki Yoshikawa
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Prof. Dr. Huanjun Chen
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