

Chao ZHUANG

Ph.D. in Materials Science & Engineering



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RESEARCH EXPERIENCE

PVD Thin Film Process for MEMS Sensors Augmentation

2021 – 2022 | National Institute for Materials Science (NIMS), Tsukuba, Japan

- **Design of Experiments** : Developed a Physical Vapor Deposition (PVD) protocol for MEMS sensor fabrication, yielding a six-fold improvement in sensor performance utilizing mechanical nonlinearity.
- **Testing**: Established an automated mechanical test leveraging nanoindentation, effectively standardizing MEMS sensor characterization, reducing sample variations, and streamlining the test cycle.
- **Finite Element Analysis (FEA)**: Performed nonlinear mechanical analysis based on reduced order models and FEA, deriving critical specifications for methodology development.
- **Analytical Techniques**: Undertook thorough thin-film quality evaluation using SEM, wafer inspection, and stylus profilometry, facilitating metrology feedback for methodology refinement.
- **Data Analysis**: Analyzed data from mechanical characterization and identified key factors that correlate with sensor performances, leading to the optimized recipe for thin film deposition.

MEMS Sensors Optimization via Generative Design Methods

2022 – 2023 | National Institute for Materials Science (NIMS), Tsukuba, Japan

- **Design Optimization**: Constructed density-based topology optimization models to enhance sensor performance, yielding innovative designs with a 30% performance boost within existing fabrication frameworks.
- **Script Automation**: Automated the optimization workflow with MATLAB parallelization, saving over 400 man-hours and tripling optimization throughput, remaining within budgetary constraints.
- **Documentation**: Established a comprehensive workflow reference, fostering a culture of knowledge sharing and collaborative learning within the laboratory.

High-Aspect-Ratio Gold Nanorods for Photonic Sensing Applications

2016 – 2019 | Sun Yat-sen University, Guangzhou, China

- **Surface Functionalization**: Synthesized metal nanoparticles via innovative methodologies, developing for surface-enhanced Raman scattering (SERS) sensing applications based on Raman spectroscopy.
- **Analytical Techniques**: Undertook nanoparticle quality evaluation using Raman, UV-vis, FTIR spectroscopy, facilitating chemical composition feedback for methodology refinement.

SELECTED PUBLICATIONS

- **Zhuang C.** et al. Linear Stiffness Tuning in MEMS Devices via Prestress Introduced by TiN Thin Films, ACS Applied Engineering Materials, 2023, 1 (4), 1213
- Shiba K. **Zhuang C.** et al. Visualization of Flow-Induced Strain Using Structural Color in Channel-Free Polydimethylsiloxane Devices, Advanced Science, 2023, 10 (1), 2204310

SKILLS

TECHNICAL SKILLS

- Design of Experiments
- Project Management
- Technology Research
- Root Cause Analysis
- Mechanical Testing
- Stylus Profilometer
- Confocal Microscopy
- Nanoindentation
- Inkjet Printer
- SEM/EDS
- Raman
- PVD
- TEM

COMPUTER SKILLS

Python • MATLAB • R
COMSOL • OpenFOAM
Mathematica • LaTeX

LANGUAGES

English • Mandarin
Cantonese • Japanese

AWARDS

Secured 1st place for exceptional presentation skills in English among 40 masters and Ph.D. students at academic seminars hosted by NIMS.

EDUCATION

UNIVERSITY OF TSUKUBA

PH.D. IN MATERIALS SCIENCE & ENGINEERING

2020 – 2023 | Tsukuba, Japan

SUN YAT-SEN UNIVERSITY

MASTER IN MICROELECTRONICS & SOLID STATE ELECTRONICS

2016 – 2019 | Guangzhou, China

Cum. GPA: 3.3 / 4.0

SUN YAT-SEN UNIVERSITY

BACHELOR IN MATERIALS PHYSICS

2012 – 2016 | Guangzhou, China

Cum. GPA: 3.6 / 4.0