Chao ZHUANG

Ph.D. in Materials Science & Engineering

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Research Experience

Thin Film Process for MEMS Sensors Augmentation

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

- **Process Optimization:** Developed a Physical Vapor Deposition (PVD) protocol for MEMS sensor fabrication, yielding a six-fold improvement in sensor performance utilizing mechanical nonlinearity.
- **Sensor 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.
- **Materials Characterization:** Undertook thorough thin-film quality evaluation using SEM, wafer inspection, and stylus profilometry, facilitating metrology feedback for methodology refinement.
- **Statistical Analysis:** Analyzed data from a 12-channel sensor system, classifying seven agricultural samples via Principle Component Analysis (PCA) for odor-detection applications.

MEMS Sensors Optimization via Generative Design Methods

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

- **Product Optimization:** Constructed desity-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.

Flow Visualization Using Structural Color in Wrinkled Microfluidic Devices

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

- **Cross Functional Collaboration:** Conducted nonlinear mechanical analysis in the cross-functional team for a novel microfluidic device, providing theoretical insights crucial to device design and manuscript preparation.
- **Multiphysics Modelling:** Applied Fluid-Structure Interaction (FSI) simulations via FEA for experiment validation under six different gases and varying testing conditions.

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 Experiment
- Project Management
- Technology Research
- Root Cause Analysis
- Confocal Microscopy
- Nanoindentation
- Inkjet Spotter
- 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