Weibin Zhang

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Job Goal

Full time industry research or engineering position related to MEMS/NEMS technology

Summary of Qualification

- Responsible, independent, positive, and easy-going team player and problem solver
- In-depth theoretic understanding of multi-physics among mechanics, electronics, and magnetics
- Expert in system modeling and simulation
- 5 years of fabrication experience in S100 clean-room and 5 years of MEMS characterization experience at the University of California, Santa Barbara
- Specialize in MEMS resonator based mechanical sensors: mass sensors, inertia sensors (accelerometers and gyros), AFM and frequency filters, with extended interests in sensing in micro-fluidics and bioengineering

Skills

| Micro | o/Nano fabrication | | | | |
|---------------------|---|--|---|-----------------|--|
| L | ithography | Dry RIE Etching/Wet Etchin | g PECVD | | |
| S | EM | Flip-Chip Bonding | SUSS Wafer Bonding | | |
| E | -Beam Evaporation | Thin Film Sputtering | Electroplating | | |
| А | .FM | CMP | 1 0 | | |
| Mult | i-physic system modeli | ng and simulation | | | |
| A | NSYS | COMSOL(FEMLAB) | MATLAB | MATLAB | |
| А | THENA | H-Spice | Mentographic | Mentographic | |
| L | -Edit | AutoCAD | SolidWorks | | |
| Micro | osystem testing and ch | aracterization | | | |
| L L Education | aser Interferometry abView Programming | Spectrum Analyzer (Network | c Analyzer) | | |
| Ph. D | • University of Californ | iia, Santa Barbara D | ec. 2006 | CGPA: 3.85/4.00 | |
| | Major: Mechanical Engineering | | | | |
| | Topics: In-Fluid Dyna High-Q MEM Committee: K. L. Tur | amics of Micro Resonators and i IS Resonators and Quality Factor ner, N. C. MacDonald, D. R. Cla | its AFM Applicat or Prediction arke and H. Soh. | ions | |
| M. S. | Mechanical Engineer | ing, Peking University, China | Jun. 1999 | CGPA: 4.00/4.00 | |
| | Topics: Lateral MEMS | Gyro Design Optimization | | | |
| B. S. | Mechanical Engineer | ing, Peking University, China | Jun. 1996 | CGPA: 3.90/4.00 | |

Professional Experiences

9/2006-Present Postdoctoral Researcher, Turner MEMS Group, California NanoSystems Institute

- Design and optimize gecko-inspired reversible adhesive
 - Design and fabricate hierarchic deformation structure (Nano-hair on flexible MEMS platforms) to achieve intimate contact between surfaces
 - Employ bimorph mechanism and apply magnetic field on ferromagnetic materials for improved peeling detachment
 - Optimize MEMS platform design and the nano-wire growth for increased frictionenhanced adhesion
 - o Potential application: Gecko-inspired robot with improved attachment and detachment

2001-2006 Ph. D. Research Assistant, University of California at Santa Barbara

Investigate the in-fluid dynamics of flexural MEMS resonators

- Experimentally explore the relationship between fluid damping and resonator design parameters (resonant frequency, dimension, and geometry) using silicon cantilevers
- Simulate the in-fluid dynamics using the ALE algorithm in COMSOL
- Theoretically derive a linear fluid damping and a quadratic loading model based on the Navier-Stokes equations and asymptotic approximations of the Bessel functions
- o Obtain consistent results from experiments, simulations and theory
- Potential applications: Tapping-mode AFM design, cantilever based mass sensors, fluid pressure sensors, and viscosity sensors
- Predict the overall Q-factor and design high-Q MEMS resonators with applications to mechanical frequency filters
 - Experimentally examine the Q-factor dependence on different energy-losing mechanisms: thermo-elastic damping, support damping, surface damping, fluid damping, and squeezed film damping
 - Achieve high Q-factor (~100,000 at 30kHz) by optimized geometric design and fabrication procedures for smooth surfaces
 - Realize bandwidth-tunable MEMS filters by applying mechanical coupling
- Perform noise analysis and compression of MEMS tunneling accelerometer using Kalman filtering and LQG (Linear-Quadratic-Gaussian) controller

1999-2000 Telecommunication product support engineer, Huawei Technologies, China

• Provide technical support for telephone switching system (C&C08) and optical network

1996-1999 M. S. Research Assistant, Peking University, China

- Simulate the performance and optimize the design of a capacitive accelerometer and a coriolis-force-based vibratory MEMS gyroscope
- Develop software combining the BEM (Boundary-Element-Method) with the FEM (Finite-Element-Method) to simulate MEMS with deformable components

Invited Talks

Veeco Instruments, Santa Barbara, CA

Sept. 2006

- In-fluid cantilever dynamics and AFM design: fluid damping and fluid loading Rowland Institute at Harvard Dec. 2006
 - In-fluid AFM cantilever dynamics and Gecko-inspired reversible adhesive design

Publication

- 1. W. Zhang, K.L. Turner, *Fluid Damping and Loading Effects of MEMS Flexural Resonators: Theory and Applications*, Physical Review, 2007, to be submitted
- 2. W. Zhang, K.L. Turner, Frequency Dependent Fluid Damping of Micro/Nano Flexural Resonators: Experiment, Model and Analysis, Sensors and Actuators A, 2006, Accepted
- W. Zhang, M. Requa, K.L. Turner, Determination of Frequency Dependent Fluid Damping of Micro and Nano Resonators for Different Cross-Sections, Nanotech 2006, Boston, MA USA, May 2006
- W. Zhang, K.L. Turner, Pressure-Dependent Damping Characteristics of Micro Silicon Beam Resonator for Different Resonant Modes, IEEE Sensors 2005, Irvine, CA Oct 31st- Nov 3rd 2005
- W. Zhang, Wenhua Zhang, K.L. Turner, Nonlinear Dynamics of Micro Impact Oscillators in High Frequency MEMS Switch Application, Transducers 2005, Coex, Seoul Korea, June 5-9, 2005
- 6. W. Zhang, K.L. Turner, *Thermoelastic damping in the longitudinal vibration: analysis and simulation*, Proceedings of 2004 ASME International Mechanical Engineering Congress, Anaheim, CA USA, Nov 13-19, 2004

- Wenhua Zhang, W. Zhang, K.L. Turner, P.G. Hartwell, SCREAM'03: A Single mask process for high-Q single crystal silicon MEMS, Proceedings of 2004 ASME International Mechanical Engineering Congress, Anaheim, CA USA, Nov 13-19, 2004
- 8. C. Wang, C. Xiong, W. Zhang, J. Fang, Z. Li, *Testing and simulation of novel MEMS relays by applying digital image correlation technology*, The first IEEE international conference on sensors, Florida USA, June 2002
- J. Fang, W. Zhang, C. Wang, Z. Li, D. Zhang, Electromechanical analysis of microelectromechanical structures and dynamic simulations of laterally vibratory microgyroscope, SPIE Proc. Vol.4407, p68-77, Edinburgh UK, May 2001

References

• Professional References

Professor Kimberly L. Turner Dept. of Mechanical Engineering, UCSB turner@engineering.ucsb.edu 1-805-893-5106 Professor George Homsy Dept. of Mechanical Engineering, UCSB bud@engineering.ucsb.edu 1-805-893-2704 Dr. Craig Prater (Veeco Fellow) Veeco Instruments, Santa Barbara, CA <u>cprater@veeco.com</u> 1-805-967-2700 (Ext. 2249)

• <u>Research Colleague References</u>

Dr. Michael Requa Dept. of Physics, UCSB requa@engineering.ucsb.edu 1-805-893-5218 Barry Demartini (Ph.D Candidate) Dept. of Mechanical Engineering, UCSB baredog@umail.ucsb.edu 1-805-893-7849 **Dr. Wenhua Zhang** Hewlett-Packard Research Labs (Palo Alto, CA) wenhua zhang@hp.com 1-650-857-2266