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Zinan Zhao

Ph.D. Candidate
Engineering Mechanics

Education

Dec. 2018 -Pre. **Visiting Ph.D**., The State University of New Jersey | Rutgers
Department of Civil and Environmental Engineering

Sep. 2014 -Nov. 2018 **Ph.D**. Candidate, Nanjing University of Aeronautics and Astronautics
College of Aerospace Engineering
Thesis: Investigation of Mode-coupled Vibrations in Thin Film Bulk Acoustic Wave Devices with High Performance Based on Frequency Spectrum Quantitative Prediction

June 2014 **B.E.**, Nanjing University of Aeronautics and Astronautics
Department of Civil and Environmental Engineering

Research Interests

- Model and Mechanical Behaviors of Thin Bilm Bulk Acoustic Resonators
- Coupled Vibration and Frequency Predictions of FBAR Sensors
- Piezoelectric/piezomagnetic Composites with Magnetoelectric Effect

Honors and Awards

Research Award and Funding

Sep. 2018 National Scholarship for Graduate Student
June 2018 China Scholarship Council Grant
Apr. 2018 Funding of Outstanding Doctoral Dissertation of NUAA (40,000 rmb)
Oct. 2017 Star Innovation Awards of NUAA
Sep. 2015 AVIC Special Scholarship
Sep. 2012 National Scholarship for Undergraduate Student

Best Student Paper Award

2015-2017 Symposium of Piezoelectricity, Acoustic Waves and Device Applications, 2015-2017

Conference Travel Award

April 2019 IEEE International Frequency Control Symposium (IFCS)

Honors

Sep. 2019 Merit Student of Jiangsu Province

Sep. 2015 Merit Student of Jiangsu Province

Oct. 2015 Second Prize of National Post-Graduate Mathematical Contest in Modeling

Professional Services

Reviewer IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (TUFFC), Applied Mathematics and Mechanics-English Edition (AMM)

Professional Society Student Member of IEEE Ultrasonics, Ferroelectrics, and Frequency Control Society
Student Member of Jiangsu Mechanical Society

Journal Publications

Under Review **Frequency shift prediction of a shear mode multi-layered FBAR sensor in viscous media using transfer matrix method**
Z. Zhao, Z. Qian and Y. K. Yong,
Submitted to Applied Mathematical Modeling

Under Review **Design Considerations for Frequency Shifts in a Laterally Finite FBAR Sensor in Contact with the Newtonian Liquid**
Z. Zhao, B. Wang, Z. Qian, I. Kuznetsova, T. Ma and Y. K. Yong,
Submitted to IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (minor revision).

2020 **Lateral size-dependence in UHF mode-coupled ZnO FBARs to suppress undesirable eigen-modes and weaken mounting effect**
Z. Zhao, X. Pang, Z. Qian, I. Kuznetsova, T. Ma and Y. K. Yong,
IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (accepted).

2020 **The design of a Frame-Like ZnO FBAR sensor for achieving uniform mass sensitivity distributions**
X. Zhao, **Z. Zhao**, B. Wang and Z. Qian,
Sensors, vol. 20, no. 8, pp. 2408.

2019 **Frequency spectra of coupling vibration in high-frequency thickness-shear ZnO thin film resonator applied in sensing field based on the Hamilton principle**
Z. Zhao, B. Wang, J. Zhu, Z. Qian and B. Huang.
IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, vol. 66, no. 8, pp. 1331-1339.

2018 **Mode couplings in high-frequency thickness-extensional vibrations of ZnO thin film resonator based on weak boundary condition**
Z. Zhao, B. Wang, J. Zhu and Z. Qian,
International Journal of Mechanical Sciences, vol. 148, pp. 223-230.

2018 **Trapped-energy thickness-extensional mode of a partially electroded ZnO thin-film resonator**
Z. Zhao, B. Wang, Z. Qian and J. Yang,
IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, vol. 65, no. 9, pp. 1669-1679.

2017 **Thickness-shear vibration of a *z*-strip AT-cut quartz crystal plate with nonuniform electrode pairs**
Z. Zhao, Z. Qian and B. Wang,
Ferroelectrics, vol. 506, no. 1, pp. 48-62.

2016 **Effects of unequal electrode pairs on an *x*-strip thickness-shear mode multi-channel quartz crystal microbalance**
Z. Zhao, Z. Qian and B. Wang,
Ultrasonics, vol. 72, pp. 73-79.

2016 **Vibration optimization of ZnO thin film bulk acoustic resonator with ring electrodes**
Z. Zhao, Z. Qian and B. Wang,
AIP Advances, vol. 6, no. 4, pp. 045201.

2016 **Energy trapping of thickness-extensional modes in thin film bulk acoustic wave filters**
Z. Zhao, Z. Qian and B. Wang,
AIP Advances, vol. 6, no. 1, pp. 015002.

2015 **Energy trapping of thickness-extensional modes in thin film bulk acoustic wave resonators**
Z. Zhao, Z. Qian, B. Wang and J. Yang,
Journal of Mechanical Science and Technology, vol. 29, no. 7, pp. 2767-2773.

2015 **Analysis of thickness-shear and thickness-twist modes of AT-cut quartz acoustic wave resonator and filter**
Z. Zhao, Z. Qian, B. Wang and J. Yang,
Applied Mathematics and Mechanics-English Edition, , vol. 36, pp. 1527-1538.

2015 **Thickness-shear and thickness-twist modes in an AT-cut quartz acoustic wave filter**
Z. Zhao, Z. Qian, B. Wang and J. Yang,
Ultrasonics, vol. 58, pp. 1-5.

Peer-reviewed Conference Publications

Nov. 2019 **Structural Optimization for Uniform Displacement Variations in ZnO FBAR Mass Sensor Using Rectangular Frame-Like Driving Electrodes**
X. Zhao, **Z. Zhao** and Z. Qian
2019 IEEE Symposium on Piezoelectrcity, Acoustic Waves and Device Applications (SPAWDA), Nov. 2019.

April 2019 **Effect of Lateral Electrode Size on Suppressing Spurious Modes in ZnO Thin Film Resonators**
Z. Zhao, Z. Qian and Y. K. Yong,
IEEE International Frequency Control Symposium (IFCS), April 2019

Jan. 2019 **A Homotopy Shape Solution for Thickness-Vibration of Centrally Partially Electroded Regular Polygonal At-Cut Quartz Resonators**
Y. Li, H. Li, **Z. Zhao** and Z. Qian
2018 Symposium on Piezoelectrcity, Acoustic Waves and Device Applications (SPAWDA), Jan. 2019.

Oct. 2017 **Structural optimization of partially ring-electroded ZnO thin film resonator**
Z. Zhao, B. Wang and Z. Qian
2017 Symposium on Piezoelectrcity, Acoustic Waves and Device Applications, Oct. 2017.
Best Student Paper Award

Oct. 2016 **Thickness-extensional trapped energy vibration of ZnO thin film bulk acoustic wave filters**
Z. Zhao, Z. Qian and B. Wang,
2016 Symposium on Piezoelectrcity, Acoustic Waves and Device Applications (SPAWDA), Oct. 2016.
Best Student Paper Award

Oct. 2016 **Advances on Modeling Study of Film Bulk Acoustic Resonators**
Z. Qian, N. Li, **Z. Zhao**, F. Zhu and B. Wang
2016 Symposium on Piezoelectrcity, Acoustic Waves and Device Applications (SPAWDA), Oct. 2016.

Nov. 2015 **Analysis of thickness-extensional modes in energy-trapped thin film resonators**
Z. Zhao, Z. Qian, B. Wang and J. Yang,
2015 Symposium on Piezoelectrcity, Acoustic Waves and Device Applications (SPAWDA), Nov. 2015.
Best Student Paper Award

Oct. 2014 **An analysis of z-strip at-cut quartz thickness-shear filters**
Z. Zhao, Z. Qian, B. Wang and J. Yang,
2014 Symposium on Piezoelectrcity, Acoustic Waves and Device Applications (SPAWDA), Oct. 2014.

Oct. 2014 **An analysis of z-strip AT-cut quartz thickness-shear resonators**
Z. Zhao, Z. Qian, B. Wang and J. Yang,
2014 Symposium on Piezoelectrcity, Acoustic Waves and Device Applications (SPAWDA), Oct. 2014.

References

Prof. Zhenghua Qian
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Prof. Jiashi Yang
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Prof. Yook-Kong Yong
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Rutgers, The State University of New Jersey
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