Shaoyun Wang

+1 (573)-489-9584, shaoyunwang@mail.missouri.edu
https://wangshaoyun.github.io
Ph.D. Student, Dept. of Mechanical & Aerospace Engineering
University of Missouri – Columbia, MO, 65211

EDUCATION

University of Missouri – Columbia — Columbia, MO, US
Ph.D. student, Mechanical Engineering — 2020-Now
Advisor: Guoliang Huang

Ningbo University — Ningbo, China
MS, Theoretical Physics — 2016-2019
Advisor: Chaohui Tong, Molecular simulation of polyelectrolytes
Advisor: Ji Wang, Dynamical theory of plates
GRE Scores: 165Q, 150V, 3W
TOEFL Scores: 88 total, 28R, 22L, 18S, 20W

Ningbo University — Ningbo, China
BE, Engineering Mechanics, GPA: 3.29/4 — 2012-2016

HONORS AND AWARDS

Second-class Scholarship — 2018, 2013
Ningbo University

Student best paper finalists — 2018
Second Academic Forum for Postgraduate of Mechanics between Ningbo University and Zhejiang University

First-class Scholarship — 2016
Ningbo University

Student best paper finalists — 2016
12th Symposium on Piezoelectricity Acoustical Theory and Device Application conference

RESEARCH EXPERIENCE

Monte Carlo simulation of weak polyelectrolyte (Still ongoing)

- Developed constant pH Monte Carlo with computational complexity $\mathcal{O}(N\log(N))$ to simulate ionization equilibrium of weak polyelectrolyte.
- Used bond fluctuation model and configurational biased Monte Carlo to accelerate equilibrium of polyelectrolytes.
- Combined Multistep algorithm with smooth particle mesh Ewald method to calculate long-range potential.
- The codes are more than 4000 lines and open sourced in GitHub: https://github.com/wangshaoyun/Bond_Fluctuation_Method_SPME

Molecular Dynamics simulation of polyelectrolytes brushes

- Used Langevin dynamics to simulate different polyelectrolyte brushes by home-made program.
- The program which equipped with most efficient algorithm for short-range and long-range potential is same efficient as Lammps and Gromacs.
- Studied morphology and charge overcompensation of star brushes, two layer structure of mixing linear and star brushes, condition of charge overcompensation of star brushes, and competition and bridging of brushes with trivalent salts.
- Analytical self-consistent field theory were also used to compare the numerical results.
- The codes are more than 5000 lines and open sourced in GitHub: https://github.com/wangshaoyun/MD_Brushes

Searching novel cuts of quartz resonators

- Established frequency temperature of infinite plates by incremental thermo field theory in continuum mechanics.
- Used global optimization by solving nonlinear equations strictly to search the cutting angles with best temperature stability.
- Explained all existed commercial cuts parameters and predicted more cuts with better temperature stability.
- Prof. Y. K. Yong in Rutgers university spoken highly of this work and a company is developing these new products.

Other theoretical research in solid mechanics

- Solved Mathieu equation of circular plate vibration.
- Solved Rayleigh wave equation in polar coordinate.
- Studied high-order deformation of plates by using power series expansion.
- Measure elastic constants by solving the inverse problem of vibration.

PATENTS

S. Y. Wang, J. Wang, L. M. Zhang, L. T. Xie, T. F. Ma, J. K. Du, M. C. Chao. A Novel Quartz Cut for Thermometer Resonator. Chinese Patent, submitted.

S. Y. Wang, J. Wang, L. M. Zhang, L. T. Xie. Novel Quartz Resonator Cuts with Stable Frequency-Temperature Property. Chinese Patent, to be submitted.

PUBLICATIONS

1. **S. Y. Wang**, C. H. Tong. Cell-lists Method for Monte Carlo Simulation, to be submitted.
2. Y. Ji, **S. Y. Wang**, C. H. Tong. The Collapse of Polyelectrolyte Brushes Made of 4-arm Stars Mediated by Trivalent Salt Ions and an Electric Field, to be submitted, co-first author.
3. T. B. Wang, **S. Y. Wang**, C. H. Tong. Charge Reversal of Polyelectrolyte Brushes Under a Collapsing Electric Field, *Chemical Physics*, under review.
4. Ji Wang, **Shaoyun Wang**, Longtao Xie, Yangyang Zhang, Lili Yuan, Jianke Du, Han Zhang (2020). The Axisymmetric Rayleigh Waves in a Semi-infinite Elastic Solid,

Theoretical and Applied Mechanics Letters, accepted.

5. **S. Y. Wang,** C. H. Tong (2020). Surface Switching of Mixed Polyelectrolyte Brushes Made of 4-arm Stars and Linear Chains: MD Simulations, *Journal of Applied Physics*, 127 (7) 074301, Editor's pick.
6. F. Zhang, **S. Y. Wang,** H. T. Ding, C. H. Tong (2019). Simulations of 3-Arm Polyelectrolyte Star Brushes under External Electric Fields, *Soft Matter*, 15, 2560-2570. (Back cover).
7. **S. Y. Wang,** L. T. Xie, L. M. Zhang, R. X. Wu, J. K. Du, J. Wang (2019). Novel Cuts of Triply-Rotated Quartz Crystal for Resonators With Ideal Cubic Frequency-Temperature Relations. *Proceedings of the 2019 Symposium on Piezoelectricity, Acoustic Waves and Device Applications*, Paper number: 18584340.
8. Xie. L. T., **S. Y. Wang**, C. Z. Zhang, J. Wang (2018). An Analysis of the Thickness Vibration of an Unelectroded Doubly-rotated Quartz Circular Plate. *Journal of Acoustical Society of America*, 144 (2), pp. 814-821
9. **S. Y. Wang**, L. M. Zhang, L. T. Xie, B. Huang, A. B. Zhang, J. K. Du, R. X. Wu, J. Wang, Y. K. Yong (2018). Novel Quartz Crystal Cuts for SAW Substrates with Cubic Frequency-temperature Relations, *2018 IEEE International Ultrasonics Symposium*, Paper number: 18348332.
10. Zhang, L. M., **Wang S. Y.**, L. T. Xie, T. F. Ma, J. K. Du, J. Wang (2018). Frequency-temperature Relations of Novel Cuts of Quartz Crystals for Resonator Applications, *2018 IEEE International Frequency Control Symposium*, Paper number: 18384201.
11. J. Wang, L. M. Zhang., **S. Y. Wang.**, L. T. Xie, B. Huang, T. F. Ma, J. K. Du, M. C. Chao, J. L. Shen, R. X. Wu, H. F. Zhang (2017). Optimal Orientations of Quartz Crystals for Bulk Acoustic Wave Resonators with the Consideration of Thermal Properties, *2017 Proceedings of Meetings on Acoustics*, 32 (1).
12. **S. Y. Wang**, R. X. Wu, S. Y. Pao, L. M. Zhang, T. F. Ma, J. K. Du, J. Wang (2016). The Frequency Equation of Thickness-shear Vibrations of SC-cut Quartz Crystal Plates, *Proceedings of the 2016 Symposium on Piezoelectricity, Acoustic Waves and Device Applications*, pp. 230-234.
13. **S. Y. Wang**, B. Neubig, J. H. Wu, T. F. Ma, J. K. Du, J. Wang (2016). Extension of the Frequency Aging Model of Crystal Resonators and Oscillators by the Arrhenius Factor, *Proceedings of the 2016 Symposium on Piezoelectricity, Acoustic Waves and Device Applications*, pp. 269-272.
14. **S. Y. Wang**, B. Neubig, K. Sato, T. Hosoda, E. Seydel, J. H. Wu, T. F. Ma, J. Wang (2016). Aging Models and Parameters of Quartz Crystal Resonators and Oscillators, *Proceedings of the 2015 Symposium on Piezoelectricity, Acoustic Waves and Device Applications*, pp. 382-385.

SELECTED PRESENTATIONS:

S. Y. Wang, J Wang, et al. Novel cuts of triply-rotated quartz crystal for resonators with ideal cubic frequency-temperature relations. Oral presentation delivered at Proceedings of the 2019

Symposium on Piezoelectricity, Acoustic Waves and Device Applications, Harbin, China, Jan. 14-17, 2019.

S. Y. Wang, L. M. Zhang et al. Novel quartz crystal cuts for saw substrates with cubic frequency-temperature relations. Poster presentation delivered at IEEE International Ultrasonics Symposium, Chiba, Japan, Oct. 18-22, 2018.

J. Wang, **S. Y. Wang** et al. Novel cuts of triply-rotated quartz crystal for resonators with ideal cubic frequency-temperature relations. Plenary talk at 5th World Congress and Expo on Oil, Gas, and Petroleum Engineering, Rosa Grand Hotel, Milan, Italy, March 28-29, 2019.

J. Wang, **S. Y. Wang** et al. Optimal orientations of quartz crystals for bulk acoustic wave resonators with superior frequency-temperature properties. Plenary talk at ICNNE, June 21-25, Milan, Italy, 2018.

L. M. Zhang, **S. Y. Wang** et al. Frequency-temperature relations of novel cuts of quartz crystals for resonator applications. Poster presentation delivered at IEEE International Frequency Control Symposium, Olympic Valley, CA, USA, May 21-14, 2018.

SKILLS

Programming:

- I have finished more than 10000 lines Matlab and 50000 lines Fortran codes.
- I am familiar with Latex/Tex in writing notes and Mathematica in derivation of formulas.
- I can use Java, HTML and Markdown to design website.
- Although not frequently used, I also know C/C++, Python and other languages.

Molecular Dynamics and FEM Analysis: Lammps, COMSOL, ANASYS, ABAQUS

Scientific Drawing: Photoshop, Illustrator, Cinema 4D

Design: Personal website, group website, conference flyer, poster, animation, book and video.