Qichen Song

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Research Interest My research interests lie primarily in electron and phonon transport in nanostructured semiconductors using optical spectroscopy such as transient thermal grating and frequency-domain thermoreflectance, and nonequilibrium Green's function calculations.

Education

Massachusetts Institute of Technology 2015 - present
Ph.D. in Mechanical Engineering, expected in Oct./Nov. 2021
Science Master in Mechanical Engineering, Feb. 2018

Huazhong University of Science and Technology 2011 - 2015
Bachelor of Engineering in Thermal Energy and Power Engineering

Courses

MechE (major): Advanced fluid mechanics, General thermodynamics, Advanced heat & mass transfer, Nano-to-macro transport processes (TA)
Physics (minor): Theory of solids II, Relativistic quantum field theory I, Relativistic quantum field theory II, Statistical mechanics I, Statistical mechanics II
EECS: Applied quantum & statistical physics, Physics for solid-state applications, Principles & applications of quantum optics
MSE: Atomistic computer modeling of materials
Math: Mathematical methods in nanophotonics, Computational science & engineering I

Awards

Kaufman Teaching Certificate Program 2020

Warren M. Rohsenow Fellowship 2015 - 2016

National Scholarship (three times) 2012 & 2013 & 2014

Publications

Q.C. Song, R. Pan, J. Shin, K. Qiao, A. Schmidt, Hong Lu, G. Chen and A. Henry, 'Observation of Anderson localization of phonons at room temperature', **2021**, *in preparation*

Q.C. Song and G. Chen, 'Non-specular electron transmission across a disordered interface', **2021**, *to be submitted*

Q.C. Song and G. Chen, 'Evaluation of diffuse mismatch model for phonon scattering at disordered interfaces', *arXiv*, **2021**, 2106.04745

T. Nguyen, N. Andrejevic, H.C. Po, **Q.C. Song**, *et al.* M. Li, Signature of many-body localization of phonons in strongly disordered superlattices, **2021**, accepted by *Nano Lett.*

C.A. Garde, X.X Yan, **Q.C. Song**, J. Li, L. Gu, T. Aoki, S-W Lee, G. Chen, R.Q. Wu, X.Q. Pan, 'Nanoscale imaging of interface reflected phonons by electron microscopy', **2021**, *in review with Nature*

H.Z. Wang, Z.P. Yao, W.S. Leong, G. S. Jung, **Q.C. Song**, M. Hempel, T. Palacios, G. Chen, M. J. Buehler, A. Aspuru-Guzik, J.Kong 'Frank-van der Merwe Growth in Bilayer Graphene', **2020**, accepted by *Matter.*

W. Ren, **Q.C. Song**, H. Zhu, J. Mao, L. You, G.A. Gamage, J. Zhou, T. Zhou, J. Jiang, C. Wang, J. Luo, J. Wu, Z. Wang, G. Chen, Z.F. Ren, 'Intermediate-level doping strategy to simultaneously optimize power factor and phonon thermal conductivity for improving thermoelectric figure of merit', *Material Today Physics*, **2020**, 15, 100250

Q.Y. Lu, S. Huberman, H.T. Zhang, **Q.C. Song**, J.Y. Wang, G. Vardar, A. Hunt, I. Waluyo, G. Chen and B. Yildiz, 'Bi-directional tuning of thermal transport in $SrCoO_x$ with electrochemically induced phase transitions', *Nat. Mater.*, **2020** 1, 8

K. Chen, B. Song, N.K. Ravichandran, Q.Y. Zheng, X. Chen, H. Lee, H.R. Sun, S. Li, G. A. Gamage, F. Tian, Z.W. Ding, **Q.C. Song**, A. Rai, H.L Wu, P. Koirala, A.J. Schmidt, K. Watanabe, B. Lv, Z.F. Ren, L. Shi, D. G. Cahill, T. Taniguchi, D. Broido and G. Chen, 'Ultrahigh thermal conductivity in isotope-enriched cubic boron nitride', *Science*, **2020**, 367, 6477

C Liu, **Q Song**, J Chen, X Li, J Cai, Z Lu, W Li, NX Fang, SP Feng, 'Electromagnetic and Chemical Enhancements of Surface-Enhanced Raman Scattering Spectra from Cu_2O Hexagonal Nanoplates' **2019**, 6, 17, 1900534

H.T. Zhu, J. Mao, Y. Li, J.F. Sun, Y.M. Wang, Q. Zhu, G.N. Li, **Q.C. Song**, J.W. Zhou, Y.H. Fu, R. He, T. Tong, Z.H. Liu, W.Y. Ren, L. You, Z.M. Wang, J. Luo, A. Sotnikov, J.M. Bao, K. Nielsch, G. Chen, D. J. Singh and Z.F. Ren, 'Discovery of TaFeSb-based half-Heuslers with high thermoelectric performance', *Nat. Commun.*, **2019**, 10, 270

Q. Zhang, **Q.C. Song**, X.Y. Wang, J.Y. Sun, Q. Zhu, K. Dahal, X. Lin, F. Cao, J.W. Zhou, S. Chen, G. Chen, Z.F. Ren, 'Functionally graded doping for High Thermoelectric Efficiency', *Energy & Environmental Science*, **2018**, 11 (4), 933-940.

J.W. Zhou, H.T. Zhu, T.H. Liu, **Q.C. Song**, R. He, J. Mao , Z.H. Liu, W.Y Ren, B. Liao, D. J. Singh, Z.F. Ren, G. Chen, 'The origin of large thermoelectric power factors in half- Heusler systems',*Nat. Commun* **2018**, 9, 1721

T.H. Liu , J.W. Zhou , M.D. Li , Z.W. Ding , **Q.C. Song** , B. Liao , L. Fu, G. Chen, 'Electron Mean-Free-Path Filtering in Dirac Material for Improved Thermoelectric Performance', *Proc. Natl. Acad. Sci.*, **2018**, 115 (5), 879-884.

M.D. Li, **Q.C Song**, W.W. Zhao, J. A. Garlow, T.H. Liu, L.J. Wu, Y.M. Zhu, J.S. Moodera, M. H. W. Chan, G. Chen, and C-Z Chang, 'Dirac-electron-mediated magnetic proximity effect in topological insulator/magnetic insulator heterostructures' , *Phys. Rev. B: Rapid Communications*, **2017**, 96, 201301.

Q.C. Song, T.H. Liu, J.W. Zhou, Z.W. Ding, G. Chen, '*Ab initio* study of electron mean free paths and thermoelectric properties of lead telluride', *Material Today Physics*, **2017**, 2, 69-77.

M. An, **Q.C. Song**, X.X. Yu, Z.L. Jin, D.K. Ma, B.L. Huang, N. Yang, 'Generalized two-temperature model for coupled phonons', *Nano Lett.*, **2017**, 17 (9), 5805-5810.

M.D. Li, **Q.C. Song**, T.H. Liu, L. Meroueh, G.D. Mahan, M.S. Dresselhaus, G. Chen, 'Tailoring superconductivity with quantum dislocations', *Nano Lett.*, **2017**, 17 (8), 4604-4610.

Q.C. Song, J.W. Zhou, L. Meroueh, D. Broido, Z.F. Ren, G. Chen, 'The effect of shallow vs. deep level doping on the performance of thermoelectric materials', *Appl. Phys. Lett.*, **2016**, 109, 263902.

Q.C. Song, M. An, X.D. Chen, Z. Peng, J.F. Zang, N. Yang, 'The adjustable thermal resistor by reversibly folding a graphene sheet', *Nanoscale*, **2016**, 8, 14943-14949.

Computer Skills Python, Qiskit, MATLAB, LaTeX, FORTRAN, C++

References

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