

Qichen Song

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Research Interest	My research interests lie primarily in energy transport in nanostructured semiconductors using optical spectroscopy such as transient thermal grating (TTG) and frequency-domain thermoreflectance (FDTR), and nonequilibrium Green's function (NEGF) calculations.	
Education and Experiences	Harvard University	Jan. 2022 - present
	Harvard Quantum Initiative Postdoctoral Fellow in Department of Chemistry and Chemical Biology	
	Massachusetts Institute of Technology	Sept. 2015 - Jan. 2022
	Ph.D. in Mechanical Engineering, Jan. 2022 <i>Phonon and electron transport through interfaces and disordered structures</i> Science Master in Mechanical Engineering, Feb. 2018	
	Huazhong University of Science and Technology	Sept. 2011 - Jun. 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	Harvard Quantum Initiative Postdoctoral Prize	2022
	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, A. Schmidt, H. Lu, A. Henry and G. Chen, 'Observation of Anderson localization of phonons at moderate temperatures', 2022 , <i>in preparation</i>	
	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 phonon dynamics by electron microscopy', 2022 , accepted by <i>Nature</i>	
	Q.C. Song and G. Chen, 'Significant reduction in semiconductor interface resistance via interfacial atomic mixing', <i>Phys. Rev. B</i> , 2022 , 105, 195306	
	L. Zhang, Y. Zhong, X. Qian, Q.C. Song , J. Zhou, L. Li, L. Guo, G. Chen, and E. N. Wang, 'Toward optimal heat transfer of 2D-3D heterostructures via van der Waals binding effects', <i>ACS Appl. Mater. Interfaces</i> , 2021 , 13, 38,	
	Q.C. Song and G. Chen, 'Evaluation of diffuse mismatch model for phonon scattering at disordered interfaces', <i>Phys. Rev. B</i> , 2021 , 104, 085310.	
	T. Nguyen, N. Andrejevic, H.C. Po, Q.C. Song , <i>et al.</i> M. Li, 'Signature of many-body localization of phonons in strongly disordered superlattices', <i>Nano Lett.</i> , 2021 , 17, 74197425	
	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', <i>Matter</i> , 2021 , 4, 10, 3339-3353.	

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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

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.

Presentations

Probing local heating and cooling at interfaces: a non-equilibrium Green's function study, APS March meeting, 2018, Los Angeles, California

Ab initio study of electron transport in lead telluride, APS March meeting, 2017, New Orleans, Louisiana

Services Journal reviewer for PRL, Nano Lett., Adv. Mater., Joule

Computer Skills Python, Qiskit, MATLAB, L^AT_EX, FORTRAN, C++

References	Gang Chen gchen2@mit.edu	Asegun Henry ase@mit.edu	Mingda Li mingda@mit.edu	Jarad Mason mason@chemistry.harvard.edu
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