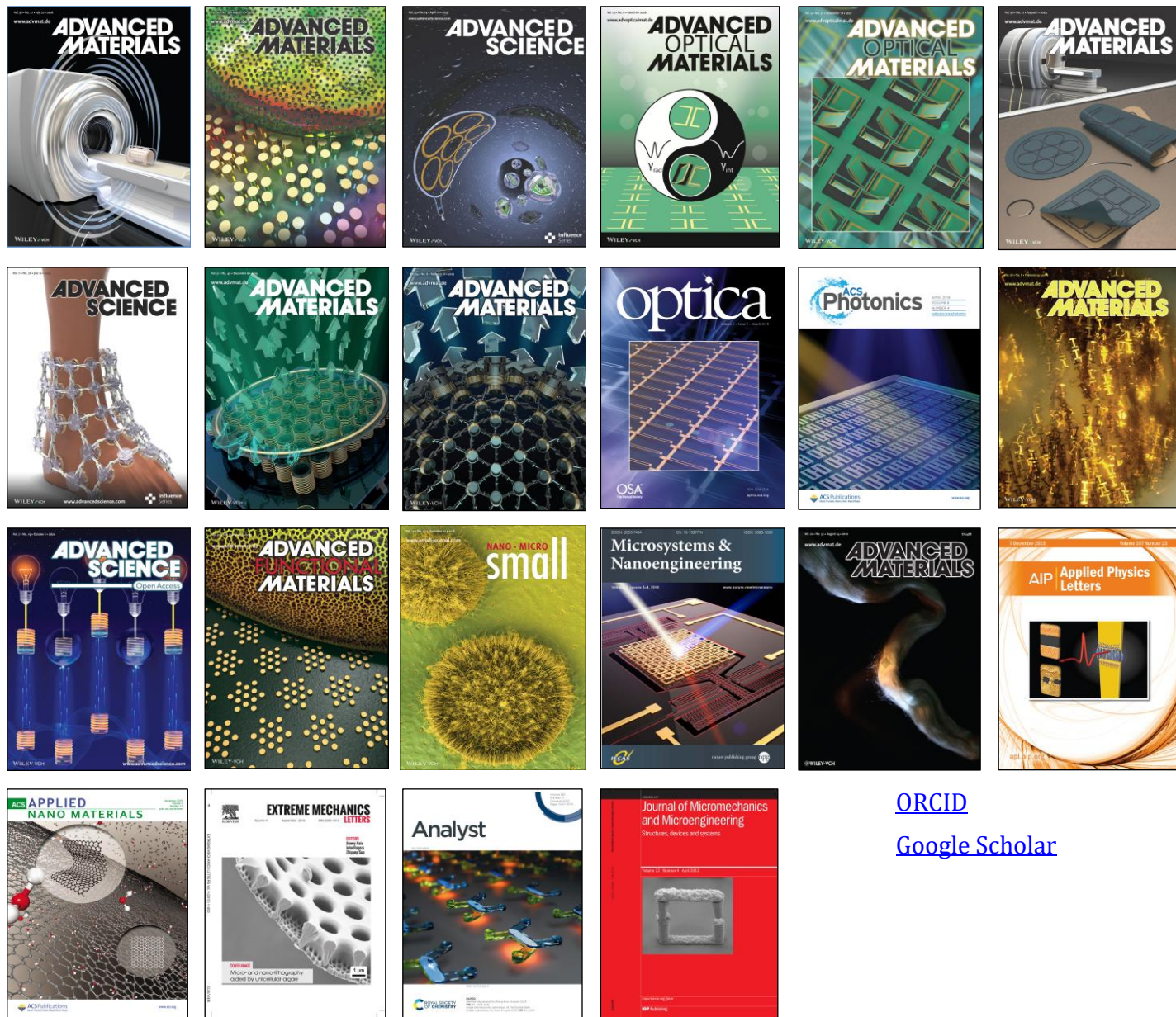


# Journal Papers

## Cover Images



[ORCID](#)

[Google Scholar](#)

#denotes graduate students/postdocs supervised by Prof. Xin Zhang; \*denotes corresponding author by X. Zhang.

2026

- [213]. [Physics-aware machine-learning-driven inverse design of broadband ultra-open acoustic metamaterials](#)  
Z. Yang#, M. Li#, X. Xie#, A. Chen#, T.G. Bifano, and **X. Zhang\***  
*Advanced Science*, 2026, 13: e76894
- [212]. [Circularly polarized metamaterial cage for homogeneous signal-to-noise ratio enhancement in magnetic resonance imaging](#)  
Y. Liu#, X. Zhu#, K. Wu#, S.W. Anderson, and **X. Zhang\***  
*Advanced Materials*, 2026, 38(41): e16569

[211]. [Few-shot deployment of pretrained MRI transformers in brain imaging tasks](#)

M. Li<sup>#</sup>, G. Shen<sup>#</sup>, C.W. Farris, and **X. Zhang\***

*Frontiers in Artificial Intelligence*, 2026, 9: 1771088

[210]. [Reconfigurable quasi-BIC terahertz metasurfaces through MEMS-induced symmetry breaking](#)

Z. Yang<sup>#</sup>, J. Zhang, S. Lee, X. Xie<sup>#</sup>, R.D. Averitt, and **X. Zhang\***

*Advanced Optical Materials*, 2026, 14(9): e03164

## 2025

[209]. [Magnetic resonance image processing transformer for general accelerated image restoration](#)

G. Shen<sup>#</sup>, M. Li<sup>#</sup>, S.W. Anderson, C.W. Farris, and **X. Zhang\***

*Scientific Reports – Nature*, 2025, 15: 40064

[208]. [Phase gradient ultra open metamaterials for broadband acoustic silencing](#)

Z. Yang<sup>#</sup>, A. Chen<sup>#</sup>, X. Xie<sup>#</sup>, S.W. Anderson, and **X. Zhang\***

*Scientific Reports – Nature*, 2025, 15: 21434

[207]. [Regularization by neural style transfer for MRI field-transfer reconstruction with limited data](#)

G. Shen<sup>#</sup>, Y. Zhu, M. Li<sup>#</sup>, R. McNaughton<sup>#</sup>, H. Jara, S.B. Andersson, C.W. Farris, S.W. Anderson, and **X. Zhang\***

*Frontiers in Artificial Intelligence*, 2025, 8: 1579251

[206]. [Electrically-shielded coil-enabled battery-free wireless sensing for underwater environmental monitoring](#)

K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, S.W. Anderson, and **X. Zhang\***

*Advanced Science*, 2025, 12(14): 2414299

[205]. [Metamaterial-enabled hybrid receive coil for enhanced magnetic resonance imaging capabilities](#)

X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and **X. Zhang\***

*Advanced Science*, 2025, 12(3): 2410907

## 2024

[204]. [Conformal metamaterials with active tunability and self-adaptivity for magnetic resonance imaging](#)

K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, X. Zhao<sup>#</sup>, S.W. Anderson, and **X. Zhang\***

*Research*, 2024, 7: 0560

[203]. [Ballistic transport enhanced heat convection at nanoscale hotspots](#)

S. Xu, Y. Xu, J. Zhang, J. Gao, X. Wang, **X. Zhang**, Y. Xue<sup>#</sup>

*Journal of Applied Physics*, 2024, 136(16): 164306

[202]. [Two-sided acoustic modulator for broadband and individual control of reflected and transmitted sound waves](#)

A. Chen<sup>#</sup> and **X. Zhang\***

*Physical Review Applied*, 2024, 22(4): 044010

[201]. [Learning to reconstruct accelerated MRI through K-space cold diffusion without noise](#)

G. Shen<sup>#</sup>, M. Li<sup>#</sup>, C.W. Farris, S.W. Anderson, and **X. Zhang\***

- [200]. [A robust near-field body area network based on coaxially-shielded textile metamaterial](#)  
X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, X. Xie<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Nature Communications*, 2024, 15: 6589
- [199]. [Diatom Cribellum-inspired hierarchical metamaterials: Unifying perfect absorption towards subwavelength color printing](#)  
X. Xie<sup>#</sup>, Y. Huang<sup>#</sup>, Z. Yang<sup>#</sup>, A. Li<sup>#</sup>, and **X. Zhang\***  
*Advanced Materials*, 2024, 36(33): 2403304
- [198]. [Wireless, customizable coaxially shielded coils for magnetic resonance imaging](#)  
K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Science Advances*, 2024, 10(24): eadn5195
- [197]. [All-silicon active bound states in the continuum terahertz metamaterials](#)  
Y. Huang<sup>#</sup>, K. Kaj, Z. Yang<sup>#</sup>, E. Alvarado, W. Man, Y. Zhang, V. Ramaprasad, R.D. Averitt, and **X. Zhang\***  
*Optics and Laser Technology*, 2024, 179: 111176
- [196]. [Wearable coaxially-shielded metamaterial for magnetic resonance imaging](#)  
X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Advanced Materials*, 2024, 36(31): 2313692
- [195]. [Computational-design enabled wearable and tunable metamaterials via freeform auxetics for magnetic resonance imaging](#)  
K. Wu<sup>#</sup>, X. Zhu<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Advanced Science*, 2024, 11(26): 2400261
- [194]. [Angle-variant metamaterial with reconfigurable phase modulation](#)  
A. Chen<sup>#</sup>, Z. Yang<sup>#</sup>, S. Anderson, and **X. Zhang\***  
*Physical Review Applied*, 2024, 21(1): 014062

## 2023

- [193]. [Attention hybrid variational net for accelerated MRI reconstruction](#)  
G. Shen<sup>#</sup>, B. Hao, M. Li<sup>#</sup>, C.W. Farris, I.C. Paschalidia, S.W. Anderson, and **X. Zhang\***  
*APL Machine Learning*, 2023, 1(4): 046116
- [192]. [Distributionally robust image classifiers for stroke diagnosis in accelerated MRI](#)  
B. Hao, G. Shen<sup>#</sup>, R. Chen, C.W. Farris, S.W. Anderson, **X. Zhang**, I.C. Paschalidia  
*Medical Image Computing and Computer Assisted Intervention – MICCAI 2023*, Springer, 2023, 14224: 768-777.
- [191]. [Helmholtz coil-inspired volumetric wireless resonator for magnetic resonance imaging](#)  
X. Zhu<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Advanced Materials Technologies*, 2023, 8(22): 2301053
- [190]. [Bayesian reconstruction of magnetic resonance k-space images using Gaussian processes](#)  
Y. Xu, C. Farris, S. Anderson, **X. Zhang**, K.A. Brown  
*Scientific Reports – Nature*, 2023, 13: 12527
- [189]. [Tunable bound states in the continuum in a reconfigurable terahertz metamaterial](#)

Y. Huang<sup>#</sup>, K. Kaj, Z. Yang<sup>#</sup>, R.D. Averitt, and **X. Zhang\***

*Advanced Optical Materials*, 2023, 11(4): 2300559

- [188]. [Composite acoustic metamaterial for broadband low-frequency acoustic attenuation](#)

A. Chen<sup>#</sup>, Z. Yang<sup>#</sup>, X. Zhao<sup>#</sup>, S. Anderson, and **X. Zhang\***

*Physical Review Applied*, 2023, 20(1): 014011

- [187]. [Steady-state monitoring of oxygen in a high-throughput organ-on-chip platform enables rapid and non-invasive assessment of drug-induced nephrotoxicity](#)

S.H. Kann<sup>#</sup>, E.M. Shaughnessey, **Xin Zhang\***, J.L. Charest, E.M. Vedula

*Analyst*, 2023, 148(14): 3204-3216

## 2022

- [186]. [Broadband labyrinthine acoustic insulator](#)

A. Chen<sup>#</sup>, X. Zhao<sup>#</sup>, Z. Yang<sup>#</sup>, S. Anderson, and **X. Zhang\***

*Physical Review Applied*, 2022, 18(6): 064057

- [185]. [Complementary vanadium dioxide metamaterial with enhanced modulation amplitude at terahertz frequencies](#)

Y. Huang<sup>#</sup>, X. Wu<sup>#</sup>, J. Schalch, G. Duan<sup>#</sup>, C. Chen<sup>#</sup>, X. Zhao<sup>#</sup>, K. Kaj, H-T Zhang, R. Engel-Herbert, R.D. Averitt, and **X. Zhang\***

*Physical Review Applied*, 2022, 18(5): 054086

- [184]. [Measurement of oxygen consumption rates of human renal proximal tubule cells in an array of organ-on-chip devices to monitor drug-induced metabolic shifts](#)

S.H. Kann<sup>#</sup>, E.M. Shaughnessey, J.R. Coppeta, H. Azizgolshani, B.C. Isenberg, E.M. Vedula, **X. Zhang\***, J.L. Charest

*Microsystems and Nanoengineering – Nature*, 2022, 8: 109

- [183]. [Quantitative MRI characterization of the extremely preterm brain at adolescence: atypical versus neurotypical developmental pathways](#)

R. McNaughton<sup>#</sup>, C. Pieper, O. Sakai, J. Rollins, **X. Zhang**, D. Kennedy, J.A. Frazier, L. Douglass, R.C. Fry, T.M. O'Shea, H. Jara, K. Kuban, for the ELGAN-ECHO study Investigators

*Radiology*, 2022, 304(2): 419-428

- [182]. [Regulatory effects of gradient microtopographies on synapse formation and neurite growth in hippocampal neurons](#)

R. McNaughton<sup>#</sup>, Y. Huo, G. Li<sup>#</sup>, A. Di Via Ioschpe, L. Yan<sup>#</sup>, H-Y Man, and **X. Zhang\***

*Journal of Micromechanics and Microengineering*, 2022, 32(7): 075005

- [181]. [Broadband terahertz silicon membrane metasurface absorber](#)

Y. Huang<sup>#</sup>, K. Kaj, C. Chen<sup>#</sup>, Y. Huang<sup>#</sup>, S.R. Haque, Y. Zhang, X. Zhao<sup>#</sup>, R.D. Averitt, and **X. Zhang\***

*ACS Photonics*, 2022, 9(4): 1150-11565

- [180]. [Metamaterial-enhanced near-field readout platform for passive microsensor tags](#)

K. Wu<sup>#</sup>, D. Duan<sup>#</sup>, C. Chen<sup>#</sup>, S.W. Anderson, X. Zhao<sup>#</sup>, and **X. Zhang\***

*Microsystems and Nanoengineering – Nature*, 2022, 8: 28

- [179]. [Auxetics-inspired tunable metamaterials for magnetic resonance imaging](#)

K. Wu<sup>#</sup>, X. Zhao<sup>#</sup>, T.G. Bifano, S.W. Anderson, and **X. Zhang\***

- [178]. [On-demand terahertz surface wave generation with microelectromechanical-system-based metasurface](#)

C. Chen<sup>#</sup>, K. Kaj, X. Zhao<sup>#</sup>, Y. Huang<sup>#</sup>, R.D. Averitt, and **X. Zhang\***

*Optica*, 2022, 9(1): 17-25

## 2021

- [177]. [3D printing of true pore-scale Berea sandstone and digital rock verification](#)

A. Li<sup>#</sup>, S. Zhang, C. Xu, X. Zhao<sup>#</sup>, and **X. Zhang\***

*SPE Journal*, 2021, 26(06): 3719-3724

- [176]. [Nanotextured dynamics of a light-induced phase transition in VO<sub>2</sub>](#)

A.J. Sternbach, F.L. Ruta, Y. Shi, T. Slusar, J. Schalch, G. Duan<sup>#</sup>, A. McLeod, **X. Zhang**, M. Liu, A.J. Millis, H-T Kim, L-Q Chen, R.D. Averitt, D.N. Basov

*Nano Letters*, 2021, 21(21): 9052-9060

- [175]. [Tunable toroidal response in a reconfigurable terahertz metamaterial](#)

C. Chen<sup>#</sup>, K. Kaj, Y. Huang<sup>#</sup>, X. Zhao<sup>#</sup>, R.D. Averitt, and **X. Zhang\***

*Advanced Optical Materials*, 2021, 9(22): 2101215

- [174]. [Absorption mode splitting of terahertz metamaterial mediated by coupling of spoof surface plasmon polariton](#)

Z. Cui, Y. Wang<sup>#</sup>, L. Yue, X. Zhao<sup>#</sup>, D. Zhang, X. Zhang, L. Hou, and **X. Zhang\***

*IEEE Transactions on Terahertz Science and Technology*, 2021, 11(6): 626-634

- [173]. [High thermal conductivity of free-standing skeleton in graphene foam](#)

J. Gao, D. Xie, X. Wang, **X. Zhang**, Y. Yue<sup>#</sup>

*Applied Physics Letters*, 2021, 117(25): 251901

## 2020

- [172]. [Unltrathin terahertz triple-band metamaterial absorbers: consideration of interlayer coupling](#)

C. Chen<sup>#</sup>, S. Can<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, R.D. Averitt, and **X. Zhang\***

*Physical Review Applied*, 2020, 14(5): 054021

- [171]. [Terahertz investigation of bound states in the continuum of metallic metasurfaces](#)

X. Zhao<sup>#</sup>, C. Chen<sup>#</sup>, K. Kaj, I. Hammock, Y. Huang<sup>#</sup>, R.D. Averitt, and **X. Zhang\***

*Optica*, 2020, 7(11): 1548-1554

- [170]. [Polarization insensitive, metamaterial absorber-enhanced long-wave infrared detector](#)

C. Chen<sup>#</sup>, Y. Huang<sup>#</sup>, K. Wu<sup>#</sup>, T.G. Bifano, S.W. Anderson, X. Zhao<sup>#</sup>, and **X. Zhang\***

*Optics Express*, 2020, 28(20): 28843-28857

- [169]. [Nonreciprocal magnetic coupling using nonlinear meta-atoms](#)

X. Zhao<sup>#</sup>, K. Wu<sup>#</sup>, C. Chen<sup>#</sup>, T.G. Bifano, S.W. Anderson, and **X. Zhang\***

*Advanced Science*, 2020, 7(19): 2001443

- [168]. [Broadband electrically tunable VO<sub>2</sub>-metamaterial terahertz switch with suppressed reflection](#)

J.S. Schalch, Y. Chi, Y. He, Y. Tang, X. Zhao<sup>#</sup>, **X. Zhang**, Q. Wen, R.D. Averitt

**2019**

- [167]. [Intelligent metamaterials based on nonlinearity for magnetic resonance imaging](#)  
X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, K. Wu<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Advanced Materials*, 2019, 31(49): 1905461
- [166]. [Strong metasurface-Josephson plasma resonance coupling in superconducting  \$\text{La}\_{2-x}\text{Sr}\_x\text{CuO}\_4\$](#)   
J.S. Schalch, K. Post, G. Duan<sup>#</sup>, X. Zhao<sup>#</sup>, Y-D Kim, J. Hone, M.M. Fogler, **X. Zhang**, D.N. Basov, R.D. Averitt  
*Advanced Optical Materials*, 2019, 7(21): 1900712
- [165]. [Terahertz-driven Stark spectroscopy of CdSe and CdSe-CdS core-shell quantum dots](#)  
B.C. Pein, C.K. Lee, L. Shi, J. Shi, W. Chang, H.Y. Hwang<sup>#</sup>, J. Scherer, I. Coropceanu, X. Zhao<sup>#</sup>, **X. Zhang**, V. Bulovic, M.G. Bawendi, A.P. Willard, K.A. Nelson  
*Nano Letters*, 2019, 19(11): 8125-8131
- [164]. [Graphene nanofluids as thermal management materials: molecular dynamics study on orientation and temperature effects](#)  
J. Gao, H. Wu, A. Li<sup>#</sup>, Y. Yue<sup>#</sup>, D. Xie, and **X. Zhang\***  
*ACS Applied Nano Materials*, 2019, 2(11): 6828-6835
- [163]. [Real-time tunable phase response and group delay in broadside coupled split-ring resonators](#)  
X. Zhao<sup>#</sup>, J. Zhang, K. Fan<sup>#</sup>, G. Duan<sup>#</sup>, J. Schalch, G.R. Keiser, R.D. Averitt, and **X. Zhang\***  
*Physical Review B*, 2019, 99(24): 245111
- [162]. [Diatom frustule-inspired metamaterial absorbers: the effect of hierarchical pattern arrays](#)  
A. Li<sup>#</sup>, X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Advanced Functional Materials*, 2019, 29(22): 1809029
- [161]. [Photo-induced terahertz near-field dynamics of graphene/InAs heterostructure](#)  
Z. Yao, J. Zhang, S. Mills, X. Zhao<sup>#</sup>, X. Chen, R. Mescall, V. Semenenko, H. Hu, T. Ciavatti, S. March, S.R. Bank, H. Tao, V. Perebeinos, **X. Zhang**, Q. Dai, X. Du, M. Liu  
*Optics Express*, 2019, 27(10): 13611-13523
- [160]. [Plasmonic heating induced by Au nanoparticles for quasi-ballistic thermal transport in multi-walled carbon nanotubes](#)  
Y. Xu<sup>+</sup>, X. Zhao<sup>#+</sup>, A. Li<sup>#</sup>, Y. Yue<sup>#</sup>, J. Jiang, and **X. Zhang\***  
*Nanoscale*, 2019, 11(16): 7572-7581
- [159]. [Boosting magnetic resonance imaging signal-to-noise ratio using magnetic metamaterials](#)  
G. Duan<sup>#</sup>, X. Zhao<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Communications Physics – Nature*, 2019, 2: 35
- [158]. [A survey of theoretical models for terahertz electromagnetic metamaterial absorbers](#)  
G. Duan<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, A. Li<sup>#</sup>, C. Chen<sup>#</sup>, R.D. Averitt, and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2019, 287: 21-28
- [157]. [Integrating microsystems with metamaterials towards metadevices](#)  
X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, A. Li<sup>#</sup>, C. Chen<sup>#</sup>, and **X. Zhang\***  
*Microsystems and Nanoengineering – Nature*, 2019, 5: 5

- [156]. [Optically modulated ultra-broadband all-silicon metamaterial terahertz absorbers](#)  
X. Zhao<sup>#</sup>, Y. Wang<sup>#</sup>, J. Schalch, G. Duan<sup>#</sup>, K. Cremin, J. Zhang, C. Chen<sup>#</sup>, R.D. Averitt, and **X. Zhang\***  
*ACS Photonics*, 2019, 6(4): 830-837
- [155]. [Implementing infrared metamaterial perfect absorbers using dispersive dielectric spacers](#)  
X. Zhao<sup>#</sup>, C. Chen<sup>#</sup>, A. Li<sup>#</sup>, G. Duan<sup>#</sup>, and **X. Zhang\***  
*Optics Express*, 2019, 27(2): 1727-1739
- [154]. [Ultra-open acoustic metamaterial silencer based on Fano-like interference](#)  
R. Ghaffarivardavagh<sup>#</sup>, J. Nikolajczyk<sup>#</sup>, S. Anderson, and **X. Zhang\***  
*Physical Review B*, 2019, 99(2): 024302
- [153]. [Glass fracture by focusing of laser-generated nanosecond surface acoustic waves](#)  
D. Veyssset, S.E. Kooi, R. Haferssas, M. Hassani-Gangaraj, M. Islam, A.A. Maznev, Y. Chernukha, X. Zhao<sup>#</sup>, K. Nakagawa, D. Martynowich, **X. Zhang**, A.M. Lomonosov, C.A. Schuh, R. Radovitzky, T. Pezeril, K.A. Nelson  
*Scripta Materialia*, 2019, 158: 42-45
- 2018**
- [152]. [Silica nanowire growth on \*Coscinodiscus species\* diatom frustules via vapor-liquid-solid process](#)  
A. Li<sup>#</sup>, X. Zhao<sup>#</sup>, S. Anderson, and **X. Zhang\***  
*Small*, 2018, 14(47): 1801822
- [151]. [Relationship between central venous catheter protein adsorption and water infused surface protection mechanisms](#)  
D.W. Sutherland<sup>#</sup>, Z.D. Blanks, **X. Zhang**, J.L. Charest  
*Artificial Organs*, 2018, 42(11): E369-E379
- [150]. [An air-spaced terahertz metamaterial perfect absorber](#)  
G. Duan<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, J. Zhang, R.D. Averitt, and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2018, 208: 303-308
- [149]. [Terahertz metamaterial perfect absorber with continuously tunable air spacer layer](#)  
J. Schalch, G. Duan<sup>#</sup>, X. Zhao<sup>#</sup>, **X. Zhang\***, R.D. Averitt<sup>\*</sup>  
*Applied Physics Letters*, 2018, 113(6): 061113
- [148]. [Time-domain transient fluorescence spectroscopy for thermal characterization of polymers](#)  
H. Wu, K. Cai, H. Zeng, W. Zhao, D. Xie, Y. Yue<sup>#</sup>, Y. Xiong, and **X. Zhang\***  
*Applied Thermal Engineering*, 2018, 138: 403-408
- [147]. [Horn-like space-coiling metamaterials toward simultaneous phase and amplitude modulation](#)  
R. Ghaffarivardavagh<sup>#</sup>, J. Nikolajczyk<sup>#</sup>, R.G. Holt, S.W. Anderson, and **X. Zhang\***  
*Nature Communications*, 2018, 9: 1349
- [146]. [Electromechanically tunable metasurface transmission waveplate at terahertz frequencies](#)  
X. Zhao<sup>#</sup>, J. Schalch, J. Zhang, H.R. Seren<sup>#</sup>, R.D. Averitt, and **X. Zhang\***  
*Optica*, 2018, 5(3): 303-310

[145]. [Analysis of the thickness dependence of metamaterial absorbers at terahertz frequencies](#)  
G. Duan<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, J. Zhang, R.D. Averitt, and **X. Zhang\***  
*Optics Express*, 2018, 26(3): 2242-2251

[144]. [Terahertz dispersion characteristics of super-aligned multi-walled carbon nanotubes and enhanced transmission through subwavelength apertures](#)  
Y. Wang<sup>#</sup>, G. Duan<sup>#</sup>, L. Zhang, L. Ma, X. Zhao<sup>#</sup>, and **X. Zhang\***  
*Scientific Reports – Nature*, 2018, 8: 2087

[143]. [Identifying the perfect absorption of metamaterial absorbers](#)  
G. Duan<sup>#</sup>, J. Schalch, X. Zhao<sup>#</sup>, J. Zhang, R.D. Averitt, and **X. Zhang\***  
*Physical Review B*, 2018, 97(3): 035128

## 2017

[142]. [Water infused surface protection as an active mechanism for fibrin sheath prevention in central venous catheters](#)  
D.W. Sutherland<sup>#</sup>, **X. Zhang**, J.L. Charest  
*Artificial Organs*, 2017, 41(10): E155-E165

[141]. [A magnetically coupled communication and charging platform for microsensors](#)  
G. Duan<sup>#</sup>, X. Zhao<sup>#</sup>, H.R. Seren<sup>#</sup>, and **X. Zhang\***  
*Journal of Microelectromechanical Systems*, 2017, 26(5): 1099-1109

[140]. [Terahertz-driven luminescence and colossal Stark effect in CdSe:CdS colloidal quantum dots](#)  
B.C. Pein, W. Chang, H.Y. Hwang<sup>#</sup>, J. Scherer, I. Coropceanu, X. Zhao<sup>#</sup>, **X. Zhang**, V. Bulovic, M. Bawendi, K.A. Nelson  
*Nano Letters*, 2017, 17(9): 5375-5380

[139]. [A three-dimensional all-metal terahertz metamaterial perfect absorber](#)  
M. Wu<sup>#</sup>, X. Zhao<sup>#</sup>, J. Zhang, K. Cremin, J. Schalch, G. Duan<sup>#</sup>, R.D. Averitt, and **X. Zhang\***  
*Applied Physics Letters*, 2017, 111(5): 051101

## 2016

[138]. [Towards uniformly oriented diatom frustule monolayers: experimental and theoretical analyses](#)  
A. Li<sup>#</sup>, W. Zhang<sup>#</sup>, R. Ghaffarivardavagh<sup>#</sup>, X. Wang<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Microsystems and Nanoengineering - Nature*, 2016, 2: 16064

[137]. [Terahertz saturable absorption in superconducting metamaterials](#)  
G.R. Keiser<sup>#</sup>, J. Zhang, X. Zhao<sup>#</sup>, **X. Zhang\***, R.D. Averitt<sup>\*</sup>  
*Journal of the Optical Society of America B*, 2016, 33(12): 2649-2655

[136]. [Microfluidic channel-based wireless charging and communication platform for microsensors with miniaturized onboard antenna](#)  
G. Duan<sup>#</sup>, X. Zhao<sup>#</sup>, H.R. Seren<sup>#</sup>, C. Chen<sup>#</sup>, A. Li<sup>#</sup>, and **X. Zhang\***  
*Journal of Micromechanics and Microengineering*, 2016, 26(12): 124002

[135]. [Broadband extraordinary terahertz transmission through super-aligned carbon nanotubes film](#)  
Y. Wang<sup>#</sup>, X. Zhao<sup>#</sup>, G. Duan<sup>#</sup>, and **X. Zhang\***

*Optics Express*, 2016, 24(14): 15730-15741

[134]. [Voltage-tunable dual-layer terahertz metamaterials](#)

X. Zhao<sup>#</sup>, K. Fan<sup>#</sup>, J. Zhang, G.R. Keiser, G. Duan<sup>#</sup>, R.D. Averitt, and **X. Zhang\***  
*Microsystems and Nanoengineering - Nature*, 2016, 2: 16025

[133]. [Nonlinear terahertz metamaterial perfect absorbers using GaAs](#)

X. Zhao<sup>#</sup>, J. Zhang, K. Fan<sup>#</sup>, G. Duan<sup>#</sup>, G.D. Metcalfe, M. Wraback, **X. Zhang\***, R.D. Averitt\*  
*Photonics Research*, 2016, 4(3): A16-A21

[132]. [Nonlinear terahertz devices utilizing semiconducting plasmonic metamaterials](#)

H.R. Seren<sup>#</sup>, J. Zhang, G.R. Keiser, S.J. Maddox, X. Zhao<sup>#</sup>, K. Fan<sup>#</sup>, S.R. Bank, **X. Zhang\***, R.D. Averitt\*  
*Light: Science & Applications – Nature*, 2016, 5: 16078

[131]. [Transmission properties of terahertz waves through asymmetric rectangular aperture arrays on carbon nanotube films](#)

Y. Wang<sup>#</sup>, Y. Tong, and **X. Zhang\***  
*AIP Advances*, 2016, 6(4): 045304

[130]. [Tunable meta-liquid crystals](#)

M. Liu, K. Fan<sup>#</sup>, W. Padilla, D.A. Powell, **X. Zhang**, I.V. Shadrivov  
*Advanced Materials*, 2016, 28(8): 1553-1558

**2015**

[129]. [Terahertz radiation-induced sub-cycle field electron emission across a split-gap dipole antenna](#)

J. Zhang<sup>+</sup>, X. Zhao<sup>#+</sup>, K. Fan<sup>#</sup>, X. Wang<sup>#</sup>, G-F Zhang, K. Geng, **X. Zhang\***, R.D. Averitt\*  
*Applied Physics Letters*, 2015, 107(23): 231101

[128]. [Centimeter level monolayer close-packed of disk-shaped diatomite particles](#)

W. Zhang<sup>#</sup>, and **X. Zhang**  
*Journal of Inorganic Materials*, 2015, 30(11): 1208-1212

[127]. [Biologically enabled micro- and nanostencil lithography using diatoms](#)

J. Cai<sup>#</sup>, X. Wang<sup>#</sup>, A. Li<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Extreme Mechanics Letters*, 2015, 4: 186-192

[126]. [A review of non-linear terahertz spectroscopy with ultrashort tabletop-laser pulses](#)

H.Y. Hwang<sup>#</sup>, S. Fleischer, N.C. Brandt, B.G. Perkins, M. Liu, K. Fan<sup>#</sup>, A.J. Sternbach, **X. Zhang**, R.D. Averitt, K.A. Nelson  
*Journal of Modern Optics*, 2015, 62(8): 1447-1479

[125]. [Optically tunable metamaterial perfect absorber on highly flexible substrate](#)

X. Zhao<sup>#</sup>, K. Fan<sup>#</sup>, J. Zhang, H.R. Seren<sup>#</sup>, G.D. Metcalfe, M. Wraback, R.D. Averitt, and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2015, 231: 74-80

[124]. [Visualization of guided and leaky wave behaviors in an indium tin oxide metallic slab waveguide](#)

S.M. Teo, C.A. Werley, C. Wang<sup>#</sup>, K. Fan<sup>#</sup>, B.K. Ofori-Okai, **X. Zhang**, R.D. Averitt, K.A. Nelson  
*Optics Express*, 2015, 23(11): 14876-14896

- [123]. [A role for matrix stiffness in the regulation of cardiac side population cell function](#)

Y. Qiu<sup>#</sup>, A.F. Bayomy, M.V. Gomez, M. Bauer, P. Du<sup>#</sup>, Y. Yang, **X. Zhang**, R. Liao  
*AJP-Heart and Circulatory Physiology*, 2015, 308(9): H990-H997

- [122]. [Enabling a microfluidic RFID readout system via miniaturization and integration](#)

H.R. Seren<sup>#</sup>, X. Zhao<sup>#</sup>, C. Chen<sup>#</sup>, C. Wang<sup>#</sup>, and **X. Zhang\***  
*Journal of Microelectromechanical Systems*, 2015, 24(2): 395-403

## 2014

- [121]. [Optically modulated multi-band terahertz perfect absorber](#)

H.R. Seren<sup>#</sup>, G.R. Keiser, L. Cao, J. Zhang, A.C. Strikwerda, K. Fan<sup>#</sup>, G.D. Metcalfe, M. Wraback, **X. Zhang\***, R.D. Averitt<sup>\*</sup>  
*Advanced Optical Materials*, 2014, 2(12): 1221-1226

- [120]. [Structural control of metamaterial oscillator strength and electric field enhancement at terahertz frequencies](#)

G.R. Keiser, H.R. Seren<sup>#</sup>, L. Cao, J. Zhang, A.C. Strikwerda, K. Fan<sup>#</sup>, G.D. Metcalfe, M. Wraback, **X. Zhang\***, R.D. Averitt<sup>\*</sup>  
*Applied Physics Letters*, 2014, 105(8): 081112

- [119]. [Cell force mapping using a double-sided micropillar array based on the moiré fringe method](#)

F. Zhang<sup>#</sup>, S. Anderson, X. Zheng<sup>#</sup>, E. Roberts<sup>#</sup>, Y. Qiu<sup>#</sup>, R. Liao, and **X. Zhang\***  
*Applied Physics Letters*, 2014, 105(3): 033702

- [118]. [Numerical investigation of components influence on characteristics of autothermal reforming of methane in micro premix chamber](#)

Y. Yan<sup>#</sup>, W. Tang, L. Zhang, **X. Zhang**, L. Niu, K. Liu, J. Zhu  
*International Journal of Hydrogen Energy*, 2014, 39(22): 11583-11591

- [117]. [Biocompatible, micro- and nano-fabricated magnetic cylinders for potential use as contrast agents for magnetic resonance imaging](#)

C. Wang<sup>#</sup>, X. Wang<sup>#</sup>, S.W. Anderson, and **X. Zhang\***  
*Sensors and Actuators B: Chemical*, 2014, 196: 670-675

- [116]. [Fabrication and characterization of composite hydrogel particles with x-ray attenuating payloads](#)

C. Wang<sup>#</sup>, X. Wang<sup>#</sup>, S. Anderson, and **X. Zhang\***  
*Journal of Vacuum Science & Technology B*, 2014, 32(3): 032001

## 2013

- [115]. [Optically tunable terahertz metamaterials on highly flexible substrates](#)

K. Fan<sup>#</sup>, X. Zhao<sup>#</sup>, J. Zhang, G.R. Keiser, H.R. Seren<sup>#</sup>, G.D. Metcalfe, M. Wraback, **X. Zhang\***, R.D. Averitt<sup>\*</sup>  
*IEEE Transactions on Terahertz Science and Technology*, 2013, 3(6): 702-708

- [114]. [Microfabricated iron oxide particles for tunable, multispectral magnetic resonance imaging](#)

X. Wang<sup>#</sup>, C. Wang<sup>#</sup>, S. Anderson, **X. Zhang\***  
*Materials Letters*, 2013, 110: 122-126.

- [113]. [Towards dynamic, tunable, and nonlinear metamaterials via near field interactions: A review](#)

G.R. Keiser, K. Fan<sup>#</sup>, **X. Zhang\***, R.D. Averitt<sup>\*</sup>

- [112]. [Characterization of the Young's modulus and residual stresses for a sputtered silicon oxynitride film using micro-structures](#)  
J. Dong<sup>#</sup>, P. Du<sup>#</sup>, and **X. Zhang**\*  
*Thin Solid Films*, 2013, 545, 414-418
- [111]. [Decoupling crossover in asymmetric broadside coupled split-ring resonators at terahertz frequencies](#)  
G.R. Keiser, A.C. Strikwerda, K. Fan<sup>#</sup>, V. Young, **X. Zhang**\*, R.D. Averitt\*  
*Physical Review B*, 2013, 88(2): 024101
- [110]. [Topographically-patterned porous membranes in a microfluidic device as an \*in vitro\* model of renal reabsorptive barriers](#)  
E.M. Frohlich<sup>#</sup>, J.L. Alonso, J.T. Borenstein, **X. Zhang**, M.A. Arnaout, J.L. Charest  
*Lab on a Chip*, 2013, 13(12): 2311-2319
- [109]. [Nonlinear terahertz metamaterials via field-enhanced carrier dynamics in GaAs](#)  
K. Fan<sup>#</sup>, H.Y. Hwang<sup>#</sup>, M. Liu, A.C. Strikwerda, A.J. Sternbach, J. Zhang, X. Zhao<sup>#</sup>, **X. Zhang**, K.A. Nelson, R.D. Averitt  
*Physical Review Letters*, 2013, 110(21): 217404
- [108]. [Tunable electrical and mechanical responses of PDMS and polypyrrole nanowire composites](#)  
P. Du<sup>#</sup>, X. Lin, and **X. Zhang**\*  
*Journal of Physics D: Applied Physics*, 2013, 46(19): 195303
- [107]. [Three-dimensional broadband tunable terahertz metamaterials](#)  
K. Fan<sup>#</sup>, A.C. Strikwerda, **X. Zhang**\*, R.D. Averitt\*  
*Physical Review B – Rapid Communications*, 2013, 87(16): 161104
- [106]. [Investigation of cellular contraction forces in the frequency domain using a PDMS micropillar-based force transducer](#)  
P. Du<sup>#</sup>, C. Chen, H. Lu, and **X. Zhang**\*  
*Journal of Microelectromechanical Systems*, 2013, 22(1): 44-53

## 2012

- [105]. [Terahertz-field-induced insulator-to-metal transition in vanadium dioxide metamaterial](#)  
M. Liu<sup>+</sup>, H.Y. Hwang<sup>#+</sup>, H. Tao<sup>#</sup>, A.C. Strikwerda, K. Fan<sup>#</sup>, G.R. Keiser, A.J. Sternbach, K.G. West, S. Kittiwatanakul, J. Lu, S.A. Wolf, F.G. Omenetto, **X. Zhang**, K.A. Nelson, R.D. Averitt  
*Nature*, 2012, 487(7407): 345-348
- [104]. [THz near-field Faraday imaging in hybrid metamaterials](#)  
N. Kumar, A.C. Strikwerda, K. Fan<sup>#</sup>, **X. Zhang**, R.D. Averitt, P.C.M. Planken, A.J.L. Adam  
*Optics Express*, 2012, 20(10): 11277-11287
- [103]. [Time-resolved imaging of near-fields in THz antennas and direct quantitative measurement of field enhancements](#)  
C.A. Werley, K. Fan<sup>#</sup>, A.C. Strikwerda, S.M. Teo, **X. Zhang**, R.D. Averitt, K.A. Nelson  
*Optics Express*, 2012, 20(8): 8551-8567
- [102]. [Three-dimensional magnetic terahertz metamaterials using a multilayer electroplating technique](#)

K. Fan<sup>#</sup>, A.C. Strikwerda, R.D. Averitt, and **X. Zhang**\*

*Journal of Micromechanics and Microengineering*, 2012, 22(4): 045011

- [101]. [Effects of composition and thermal annealing on the mechanical properties of silicon oxycarbide films](#)

P. Du<sup>#</sup>, X. Wang<sup>#</sup>, I-K Lin<sup>#</sup>, and **X. Zhang**\*

*Sensors and Actuators A: Physical*, 2012, 176: 90-98

- [100]. [Thermal conductivity and photoluminescence of light-emitting silicon nitride films](#)

A. Marconnet, M. Panzer, S. Yerci, S. Minissale, X. Wang<sup>#</sup>, **X. Zhang**, L.D. Negro, K.E. Goodson  
*Applied Physics Letters*, 2012, 100(5): 051908

- [99]. [Single-layer terahertz metamaterials with bulk optical constants](#)

W.-C. Chen, A. Totachawattana, K. Fan<sup>#</sup>, J.L. Ponsetto, A.C. Strikwerda, **X. Zhang**, R.D. Averitt, W.J. Padilla

*Physical Review B*, 2012, 85(3): 035112

- [98]. [Flexible metamaterial absorbers for stealth applications at terahertz frequencies](#)

K. Iwaszczuk, A.C. Strikwerda, K. Fan<sup>#</sup>, **X. Zhang**, R.D. Averitt, P. Uhd Jepsen

*Optics Express*, 2012, 20(1): 635-643

- [97]. [The use of controlled surface topography and flow-induced shear stress to influence renal epithelial cell function](#)

E.M. Frohlich<sup>#</sup>, **X. Zhang**, J.L. Charest

*Integrative Biology*, 2012, 4(1): 75-83

## 2011

- [96]. [A PDMS microfluidic impedance immunosensor for \*E. coli\* O157:H7 and \*Staphylococcus aureus\* detection via antibody-immobilized nanoporous membrane](#)

F. Tan, P.H.M. Leung, Z-B Liu, Y. Zhang, L. Xiao, W. Ye, **X. Zhang**, L. Yi, M. Yang

*Sensors and Actuators B: Chemical*, 2011, 159(1): 328-335

- [95]. [Extremely thin metamaterial as slab waveguide at terahertz frequencies](#)

Y. Minowa, M. Nagai, H. Tao<sup>#</sup>, K. Fan<sup>#</sup>, A.C. Strikwerda, **X. Zhang**, R.D. Averitt, K. Tanaka

*IEEE Transactions on Terahertz Science and Technology*, 2011, 1(2): 441-449

- [94]. [Microwave and terahertz wave sensing with metamaterials](#)

H. Tao<sup>#</sup>, E.A. Kadlec, A.C. Strikwerda, K. Fan<sup>#</sup>, W.J. Padilla, R.D. Averitt, E.A. Shaner, and **X. Zhang**\*

*Optics Express*, 2011, 19(22): 21620-21626

- [93]. [Electromagnetic composite-based reflecting terahertz waveplates](#)

A.C. Strikwerda, R.D. Averitt, K. Fan<sup>#</sup>, **X. Zhang**, G.D. Metcalfe, M. Wraback

*International Journal of High Speed Electronics and Systems*, 2011, 20(3): 583-588

- [92]. [Effect of loading rates on cellular force measurements by polymer micropillar based transducers](#)

P. Du<sup>#</sup>, X. Zheng<sup>#</sup>, I-K Lin<sup>#</sup>, and **X. Zhang**\*

*Applied Physics Letters*, 2011, 99(8): 083701

- [91]. [Metamaterials on paper as a sensing platform](#)

H. Tao<sup>#</sup>, L. Chieffo, M.A. Brenckle, S.M. Siebert, M. Liu, A.C. Strikwerda, K. Fan<sup>#</sup>, D.L. Kaplan, **X. Zhang\***, R.D. Averitt\*, F.G. Omenetto\*  
*Advanced Materials*, 2011, 23(28): 3197-3201

[90]. [Inelastic deformation of bilayer microcantilevers with nanoscale coating](#)

I-K Lin<sup>#</sup>, **X. Zhang\***, Y. Zhang\*

*Sensors and Actuators A: Physical*, 2011, 168(1): 1-9

[89]. [Mechanical property characterization of sputtered and plasma enhanced chemical deposition \(PECVD\) silicon nitride films after rapid thermal annealing](#)

P-H Wu, I-K Lin<sup>#</sup>, H-Y Yan, K-S Ou, K-S Chen, and **X. Zhang\***

*Sensors and Actuators A: Physical*, 2011, 168(1): 117-126

[88]. [Stand-up magnetic metamaterials at terahertz frequencies](#)

K. Fan<sup>#</sup>, A.C. Strikwerda, H. Tao<sup>#</sup>, **X. Zhang\***, R.D. Averitt\*

*Optics Express*, 2011, 19(13): 12619-12627

[87]. [Temperature distribution on thermal conductivity detectors for flow rate insensitivity](#)

B.C. Kaanta<sup>#</sup>, A.J. Jonca<sup>#</sup>, H. Chen, and **X. Zhang\***

*Sensors and Actuators A: Physical*, 2011, 167(2): 146-151

[86]. [Frequency tunable terahertz metamaterials using broadside coupled split-ring resonators](#)

E. Ekmekci, A.C. Strikwerda, K. Fan<sup>#</sup>, G.R. Keiser, **X. Zhang**, G. Turhan-Sayan, R.D. Averitt

*Physical Review B*, 2011, 83(19): 193103

[85]. [Opto-mechanical platforms for cell force study](#)

X. Zheng<sup>#</sup> and **X. Zhang\***, *Micro and Nano Letters*, 2011, 6(5): 332-336.

[84]. [MEMS based structurally tunable metamaterials at terahertz frequencies](#)

H. Tao<sup>#</sup>, A.C. Strikwerda, K. Fan<sup>#</sup>, W.J. Padilla, **X. Zhang\***, R.D. Averitt\*

*Journal of Infrared, Millimeter, and Terahertz Waves*, 2011, 32: 580-595

[83]. [Microsystems for cellular force measurement: a review](#)

X. Zheng<sup>#</sup> and **X. Zhang\***

*Journal of Micromechanics and Microengineering*, 2011, 21(5): 054003.

[82]. [Whole field decoupling of predistortion on polymeric cell force transducer](#)

X. Zheng<sup>#</sup> and **X. Zhang\***

*Applied Physics Letters*, 2011, 98(17): 173701

[81]. [Effect of forced convection on thermal distribution in micro thermal conductivity detectors](#)

B.C. Kaanta<sup>#</sup>, H. Chen, and **X. Zhang\***

*Journal of Micromechanics and Microengineering*, 2011, 21(4): 045017

[80]. [Recent progress in electromagnetic metamaterial devices for terahertz applications](#)

H. Tao<sup>#</sup>, W.J. Padilla, **X. Zhang\***, R.D. Averitt\*

*IEEE Journal of Selected Topics in Quantum Electronics*, 2011, 17(1): 92-101

## 2010

[79]. [Performance enhancement of terahertz metamaterials on ultrathin substrates for sensing applications](#)

H. Tao<sup>#</sup>, A.C. Strikwerda, M. Liu, J.P. Mondia, E. Ekmekci, K. Fan<sup>#</sup>, D.L. Kaplan, W.J. Padilla, **X. Zhang**, R.D. Averitt, F.G. Omenetto  
*Applied Physics Letters*, 2010, 97(26): 261909

[78]. [A dual band terahertz metamaterial absorber](#)

H. Tao<sup>#</sup>, C.M. Bingham, D. Pilon, K. Fan<sup>#</sup>, A.C. Strikwerda, D. Shrekenhamer, W.J. Padilla, **X. Zhang**<sup>\*</sup>, R.D. Averitt<sup>\*</sup>  
*Journal of Physics D: Applied Physics*, 2010, 43(22): 225102

[77]. [A multilayer bending model for conducting polymer actuators](#)

P. Du<sup>#</sup>, X. Lin, and **X. Zhang**<sup>\*</sup>  
*Sensors and Actuators A: Physical*, 2010, 163(1): 240-246

[76]. [Novel device for calibration-free flow rate measurements in micro gas chromatographic systems](#)

B.C. Kaanta<sup>#</sup>, H. Chen, and **X. Zhang**<sup>\*</sup>  
*Journal of Micromechanics and Microengineering*, 2010, 20(9): 095034

[75]. [Extension of the beam theory for polymer bio-transducers with low aspect ratios and viscoelastic characteristics](#)

P. Du<sup>#</sup>, I-K Lin<sup>#</sup>, H. Lu, and **X. Zhang**<sup>\*</sup>  
*Journal of Micromechanics and Microengineering*, 2010, 20(9): 095016

[74]. [Metamaterial silk composites at terahertz frequencies](#)

H. Tao<sup>#</sup>, J.J. Amsden, A.C. Strikwerda, K. Fan<sup>#</sup>, D.L. Kaplan, **X. Zhang**<sup>\*</sup>, R.D. Averitt<sup>\*</sup>, F.G. Omenetto<sup>\*</sup>  
*Advanced Materials*, 2010, 22(32): 3527-3531

[73]. [A versatile cell contractility mapping transducer utilizing moiré-based technique](#)

X. Zheng<sup>#</sup>, H.K. Surks, and **X. Zhang**<sup>\*</sup>  
*Journal of Microelectromechanical Systems*, 2010, 19(4): 764-773

[72]. [Single cell contractility studies based on compact moiré system over periodic gratings](#)

X. Zheng<sup>#</sup>, H.K. Surks, and **X. Zhang**<sup>\*</sup>  
*Applied Physics Letters*, 2010, 96(21): 213705

[71]. [A monolithically fabricated gas chromatography separation column with an integrated high sensitivity thermal conductivity detector](#)

B.C. Kaanta<sup>#</sup>, H. Chen, and **X. Zhang**<sup>\*</sup>  
*Journal of Micromechanics and Microengineering*, 2010, 20(5): 055016

[70]. [Transport, analyte detection and opto-electronic response of p-type CuO nanowires](#)

B.J. Hansen<sup>#</sup>, N. Kouklin, G. Lu, I-K Lin<sup>#</sup>, J. Chen, and **X. Zhang**<sup>\*</sup>  
*Journal of Physical Chemistry C*, 2010, 114(6): 2440-2447

**2009**

[69]. [Reconfigurable terahertz metamaterials](#)

H. Tao<sup>#</sup>, A.C. Strikwerda, K. Fan<sup>#</sup>, W.J. Padilla, **X. Zhang**<sup>\*</sup>, R.D. Averitt<sup>\*</sup>  
*Physical Review Letters*, 2009, 103(14): 147401

[68]. [Viscoelastic characterization and modeling of polymer transducers for biological applications](#)

I-K Lin<sup>#</sup>, K-S Ou, Y-M Liao, Y. Liu<sup>#</sup>, K-S Chen, and **X. Zhang**<sup>\*</sup>

- [67]. [Intervention of cardiomyocyte death based on real-time monitoring of cell adhesion through impedance sensing](#)  
Y. Qiu<sup>#</sup>, R. Liao, and **X. Zhang**\*  
*Biosensors and Bioelectronics*, 2009, 25(1): 147-153
- [66]. [Thermomechanical behavior and microstructural evolution of SiN<sub>x</sub>/Al bimaterial microcantilevers](#)  
I-K Lin<sup>#</sup>, **X. Zhang**\*, Y. Zhang\*  
*Journal of Micromechanics and Microengineering*, 2009, 19(8): 085010
- [65]. [Impedance-based monitoring of ongoing cardiomyocyte death induced by tumor necrosis factor- \$\alpha\$](#)   
Y. Qiu<sup>#</sup>, R. Liao, and **X. Zhang**\*  
*Biophysical Journal*, 2009, 96(5): 1985-1991
- [64]. [ROCK isoform regulation of myosin phosphatase and contractility in vascular smooth muscle cells](#)  
Y. Wang, X. Zheng<sup>#</sup>, N. Riddick, M. Bryden, W. Baur, **X. Zhang**, H.K. Surks  
*Circulation Research*, 2009, 104(4): 531-540
- [63]. [Comparison of birefringent electric split-ring resonator and meanderline structures as quarter-wave plates at terahertz frequencies](#)  
A.C. Strikwerda<sup>+</sup>, K. Fan<sup>#+</sup>, H. Tao<sup>#</sup>, D.V. Pilon, **X. Zhang**\*, R.D. Averitt\*  
*Optics Express*, 2009, 17(1): 136-149

## 2008

- [62]. [Viscoelastic mechanical behavior of soft microcantilever-based force sensors](#)  
I-K Lin<sup>#</sup>, Y-M Liao, Y. Liu<sup>#</sup>, K-S Ou, K-S Chen, and **X. Zhang**\*  
*Applied Physics Letters*, 2008, 93(25): 251907
- [61]. [Highly flexible wide angle of incidence terahertz metamaterial absorber: design, fabrication, and characterization](#)  
H. Tao<sup>#</sup>, C.M. Bingham, A.C. Strikwerda, D. Pilon, D. Shrekenhamer, N.I. Landy, K. Fan<sup>#</sup>, **X. Zhang**\*, W.J. Padilla, R.D. Averitt\*  
*Physical Review B – Rapid Communications*, 2008, 78(24): 241103
- [60]. [Terahertz metamaterials on free-standing highly-flexible polyimide substrates](#)  
H. Tao<sup>#</sup>, A.C. Strikwerda, K. Fan<sup>#</sup>, C.M. Bingham, W.J. Padilla, **X. Zhang**\*, R.D. Averitt\*  
*Journal of Physics D: Applied Physics*, 2008, 41(23): 232004.
- [59]. [Planar wallpaper group metamaterials for novel terahertz applications](#)  
C.M. Bingham, H. Tao<sup>#</sup>, X. Liu, R.D. Averitt, **X. Zhang**, W.J. Padilla  
*Optics Express*, 2008, 16(23): 18565-18575
- [58]. [An optical Moiré technique for cell traction force mapping](#)  
X. Zheng<sup>#</sup> and **X. Zhang**\*  
*Journal of Micromechanics and Microengineering*, 2008, 18(12): 125006
- [57]. [Optical moiré as a visualization tool for living vascular cell contraction force mapping](#)  
X. Zheng<sup>#</sup> and **X. Zhang**\*

*Applied Physics Letters*, 2008, 93(16): 164106

- [56]. [Mechanical properties of sputtered silicon oxynitride films by nanoindentation](#)  
Y. Liu<sup>#</sup>, I-K Lin<sup>#</sup>, and **X. Zhang**\*  
*Materials Science and Engineering A*, 2008, 489(1-2): 294-301
- [55]. [Development of double-cantilever infrared detectors: fabrication, curvature control and demonstration of thermal detection](#)  
S. Huang<sup>#</sup>, H. Tao<sup>#</sup>, I-K Lin<sup>#</sup>, and **X. Zhang**\*  
*Sensors and Actuators A: Physical*, 2008, 145-146: 231-240
- [54]. [The deformation of microcantilever-based infrared detectors during thermal cycling](#)  
I-K Lin<sup>#</sup>, Y. Zhang, and **X. Zhang**\*  
*Journal of Micromechanics & Microengineering*, 2008, 18(7): 075012
- [53]. [A metamaterial absorber for the terahertz regime: Design, fabrication and characterization](#)  
H. Tao<sup>#</sup>, N.I. Landy, C.M. Bingham, **X. Zhang**, R.D. Averitt, W.J. Padilla  
*Optics Express*, 2008, 16(10): 7181-7188
- [52]. [Nanoindentation stress-strain curves of plasma-enhanced chemical vapor deposited silicon oxide thin films](#)  
Z. Cao<sup>#</sup> and **X. Zhang**\*  
*Thin Solid Films*, 2008, 516(8): 1941-1951
- [51]. [Real-time monitoring primary cardiomyocyte adhesion based on electrochemical impedance spectroscopy and electrical cell-substrate impedance sensing](#)  
Y. Qiu<sup>#</sup>, R. Liao, **X. Zhang**\*  
*Analytical Chemistry*, 2008, 80(4): 990-996
- [50]. [Profile control in silicon nanostructures using fluorine-enhanced oxide passivation](#)  
Y. Zhao<sup>#</sup> and **X. Zhang**\*  
*IEEE Transactions on Nanotechnology*, 2008, 7(1): 40-47

## 2007

- [49]. [Simultaneous orientation and cellular force measurements in adult cardiac myocytes using three-dimensional polymeric microstructures](#)  
Y. Zhao<sup>#</sup>, C.C. Lim, D.B. Sawyer, R. Liao, and **X. Zhang**\*  
*Cell Motility and the Cytoskeleton*, 2007, 64(9): 718-725
- [48]. [Study of gradient stress in bimaterial cantilever structures for infrared applications](#)  
S. Huang<sup>#</sup> and **X. Zhang**\*  
*Journal of Micromechanics and Microengineering*, 2007, 17(7): 1211-1219
- [47]. [Adaptation of myofibrils to a microstructured polymeric substrate](#)  
Y. Zhao<sup>#</sup> and **X. Zhang**\*  
*Sensors and Actuators A: Physical*, 2007, 136(2): 491-495
- [46]. [A novel impedance assay for cardiac myocyte hypertrophy sensing](#)  
M. Yang<sup>#</sup> and **X. Zhang**\*  
*Sensors and Actuators A: Physical*, 2007, 136(2): 504-509

- [45]. [Electrical assisted patterning of cardiac myocytes with controlled macroscopic anisotropy using a microfluidic dielectrophoresis chip](#)  
M. Yang<sup>#</sup> and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2007, 135(1): 73-79
- [44]. [A novel microfluidic impedance assay for monitoring endothelin-induced cardiomyocyte hypertrophy](#)  
M. Yang<sup>#</sup>, C.C. Lim, R. Liao, and **X. Zhang\***  
*Biosensors and Bioelectronics*, 2007, 22(8): 1688-1693
- [43]. [Gradient residual stress induced elastic deformation of multilayer MEMS structures](#)  
S. Huang<sup>#</sup> and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2007, 134(1): 177-185
- [42]. [Nanoindentation creep of plasma-enhanced chemical vapor deposited silicon oxide thin films](#)  
Z. Cao<sup>#</sup> and **X. Zhang\***  
*Scripta Materialia*, 2007, 56(3): 249-252
- 2006**
- [41]. [Oriented and vectorial patterning of cardiac myocytes using a microfluidic dielectrophoresis chip – towards engineered cardiac tissue with controlled macroscopic anisotropy](#)  
M. Yang<sup>#</sup>, C.C. Lim, R. Liao, and **X. Zhang\***  
*Journal of Microelectromechanical Systems*, 2006, 15(6): 1483-1491
- [40]. [Size-dependent creep behaviour of plasma-enhanced chemical vapour deposited silicon oxide films](#)  
Z. Cao<sup>#</sup> and **X. Zhang\***  
*Journal of Physics D: Applied Physics*, 2006, 39(23): 5054-5063
- [39]. [Determination of the deformations in polymeric nanostructures using geometric moiré techniques for biological applications](#)  
Y. Zhao<sup>#</sup> and **X. Zhang\***  
*Sensors and Actuators B: Chemical*, 2006, 117(2): 376-383
- [38]. [Elimination of stress-induced curvature in microcantilever infrared focal plane arrays](#)  
S. Huang<sup>#</sup>, B. Li<sup>#</sup>, and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2006, 130-131: 331-339
- [37]. [Microchip for subcellular mechanics study in living cells](#)  
Y. Zhao<sup>#</sup>, C.C. Lim, D.B. Sawyer, R. Liao, and **X. Zhang\***  
*Sensors and Actuators B: Chemical*, 2006, 114(2): 1108-1115
- [36]. [Fabrication of three-dimensional microstructures based on singled-layered SU-8 for lab-on-chip applications](#)  
H. Yu<sup>#</sup>, O. Balogun, B. Li<sup>#</sup>, T.W. Murray, and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2006, 127(2): 228-34
- [35]. [Experiments and theory of thermally-induced stress relaxation in amorphous dielectric films for MEMS and IC application](#)  
Z. Cao<sup>#</sup> and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2006, 127(2): 221-227

- [34]. [An approach for creating polymeric microstructures with various aspect ratios for cellular analysis applications](#)  
Y. Zhao<sup>#</sup> and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2006, 127(2): 216-220
- [33]. [Extension of the Stoney formula for film–substrate systems with gradient stress for MEMS applications](#)  
S. Huang<sup>#</sup> and **X. Zhang\***  
*Journal of Micromechanics and Microengineering*, 2006, 16(2): 382-389
- [32]. [Flexible fabrication of three-dimensional multi-layered microstructures using a scanning laser system](#)  
H. Yu<sup>#</sup>, B. Li<sup>#</sup>, and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2006, 125(2): 553-564
- [31]. [Cellular mechanics study in cardiac myocytes using PDMS pillars array](#)  
Y. Zhao<sup>#</sup> and **X. Zhang\***  
*Sensors and Actuators A: Physical*, 2006, 125(2): 398-404

## 2005

- [30]. [Adaptation of flexible polymer fabrication to cellular mechanics study](#)  
Y. Zhao<sup>#</sup> and **X. Zhang\***  
*Applied Physics Letters*, 2005, 87(14): 144101
- [29]. [Cellular force measurements using single-spaced polymeric microstructures: isolating cells from base substrate](#)  
Y. Zhao<sup>#</sup>, C.C. Lim, D.B. Sawyer, R. Liao, and **X. Zhang\***  
*Journal of Micromechanics and Microengineering*, 2005, 15(9): 1649-1656
- [28]. [Microbridge testing of plasma-enhanced chemical-vapor deposited silicon oxide films on silicon wafers](#)  
Z. Cao<sup>#</sup>, T-Y Zhang, and **X. Zhang\***  
*Journal of Applied Physics*, 2005, 97(10): 104909
- [27]. [High-speed microfabricated silicon turbomachinery and fluid film bearings](#)  
L.G. Frechette, S.A. Jacobson, K.S. Breuer, F.F. Ehrich, R. Ghodssi, R. Khanna, C.W. Wong, **X. Zhang**, M.A. Schmidt, A.H. Epstein  
*Journal of Microelectromechanical Systems*, 2005, 14(1): 141-152

## 2004

- [26]. [Building embedded microchannels using a single layered SU-8, and determining Young's modulus using a laser acoustic technique](#)  
H. Yu<sup>#</sup>, O. Balogun, B. Li<sup>#</sup>, T.W. Murray, and **X. Zhang\***  
*Journal of Micromechanics and Microengineering*, 2004, 14(11): 1576-1584
- [25]. [Density change and viscous flow during structural relaxation of plasma-enhanced chemical-vapor-deposited silicon oxide films](#)  
Z. Cao<sup>#</sup> and **X. Zhang\***  
*Journal of Applied Physics*, 2004, 96(8): 4273-4280
- [24]. [Pumping capacity and reliability of cryogenic micro-pump for micro-satellite applications](#)

**X. Zhang\***, Y. Zhao<sup>#</sup>, B. Li<sup>#</sup>, and D. Ludlow<sup>#</sup>

*Journal of Micromechanics and Microengineering*, 2004, 14(10): 1421-1429

- [23]. [Rapid three-dimensional manufacturing of microfluidic structures using a scanning laser system](#)

B. Li<sup>#</sup>, H. Yu<sup>#</sup>, A. Sharon, and **X. Zhang\***

*Applied Physics Letters*, 2004, 85(12): 2426-2428

- [22]. [A self-acting gas thrust bearing for high-speed microrotors](#)

C.W. Wong, **X. Zhang**, S.A. Jacobson, and A.H. Epstein

*Journal of Microelectromechanical Systems*, 2004, 13(2): 158-164

- [21]. [Strain analysis in MEMS/NEMS structures and devices by using focused ion beam system](#)

B. Li<sup>#</sup>, X. Tang, H. Xie, and **X. Zhang\***

*Sensors and Actuators A: Physical*, 2004, 111(1): 57-62

## 2003

- [20]. [High power density silicon combustion systems for micro gas turbine engines](#)

C.M. Spadaccini, A. Mehra, J. Lee, **X. Zhang**, S. Lukachko, I.A. Waitz

*Journal of Engineering for Gas Turbines and Power*, 2003, 125(3): 709-719

- [19]. [Intrinsic stress generation and relaxation of plasma-enhanced chemical vapor deposited oxide during deposition and subsequent thermal cycling](#)

K-S Chen, **X. Zhang**, S-Y Lin

*Thin Solid Films*, 2003, 434(1-2): 190-202

- [18]. [Enhancement of rotordynamic performance of high-speed micro-rotors for power MEMS applications by precision deep reactive ion etching](#)

N. Miki, C.J. Teo, L. Ho, **X. Zhang**

*Sensors and Actuators A: Physical*, 2003, 104(3): 263-267

- [17]. [Igniters and temperature sensors for a micro-scale combustion system](#)

**X. Zhang**, A. Mehra, A.A. Ayon, I.A. Waitz

*Sensors and Actuators A: Physical*, 2003, 103(1-2): 253-262

- [16]. [Characterization of silicon wafer bonding for Power MEMS applications](#)

A.A. Ayon, **X. Zhang**, K. Turner, D. Choi, B. Miller, S.F. Nagle, S.M. Spearing

*Sensors and Actuators A: Physical*, 2003, 103(1-2): 1-8

- [15]. [Preliminary development of a hydrocarbon-fueled catalytic micro-combustor](#)

C.M. Spadaccini, **X. Zhang**, C.P. Cadou, N. Miki, I.A. Waitz

*Sensors and Actuators A: Physical*, 2003, 103(1-2): 219-224

- [14]. [Thermo-mechanical behavior of thick PECVD oxide films for power MEMS applications](#)

**X. Zhang\***, K-S Chen, S.M. Spearing

*Sensors and Actuators A: Physical*, 2003, 103(1-2): 263-270

- [13]. [Multi-stack silicon-direct wafer bonding for 3D MEMS manufacturing](#)

N. Miki, **X. Zhang**, R. Khanna, A.A. Ayon, D. Ward, S.M. Spearing

*Sensors and Actuators A: Physical*, 2003, 103(1-2): 194-201

## 2002 and earlier

- [12]. [Effect of process parameters on the surface morphology and mechanical performance of silicon structures after deep reactive ion etching \(DRIE\)](#)  
K-S Chen, A.A. Ayon, **X. Zhang**, S.M. Spearing  
*Journal of Microelectromechanical Systems*, 11(3): 264-275
- [11]. [Anisotropic silicon trenches 300–500  \$\mu\text{m}\$  deep employing time multiplexed deep etching \(TMDE\)](#)  
A.A. Ayon, **X. Zhang**, R. Khanna  
*Sensors and Actuators A: Physical*, 91(3): 381-385.
- [10]. [Residual stress and fracture in thick tetraethylorthosilicate \(TEOS\) and silane-based PECVD oxide films](#)  
**X. Zhang**, K-S Chen, R. Ghodssi, A.A. Ayon, S.M. Spearing  
*Sensors and Actuators A: Physical*, 91(3): 373-380
- [9]. [A six-wafer combustion system for a silicon micro gas turbine engine](#)  
A. Mehra, **X. Zhang**, A.A. Ayon, I.A. Waitz, M.A. Schmidt, C.M. Spadaccini  
*Journal of Microelectromechanical Systems*, 9(4): 517-527.
- [8]. [Through-wafer electrical interconnect for multilevel microelectromechanical system devices](#)  
A. Mehra, **X. Zhang**, A.A. Ayon, I.A. Waitz, M.A. Schmidt  
*Journal of Vacuum Science & Technology B*, 18(5): 2583-2589
- [7]. [Micro-Raman spectral analysis of the subsurface damage layer in machined silicon wafers](#)  
L-Q Chen, **X. Zhang**, T-Y Zhang, H.Y. Lin, S.B. Lee  
*Journal of Materials Research*, 15(7): 1441-1444
- [6]. [Rapid thermal annealing of polysilicon thin films](#)  
**X. Zhang**, T-Y Zhang, M. Wong, Y. Zohar  
*Journal of Microelectromechanical Systems*, 7(4): 356-364
- [5]. [Measurements of residual stresses in thin films using micro-rotating-structures](#)  
**X. Zhang**, T-Y Zhang, Y. Zohar  
*Thin Solid Films*, 335(1-2): 97-105
- [4]. [Buckling of polysilicon microbeams during sacrificial layer removal](#)  
T-Y Zhang, **X. Zhang**, Y. Zohar  
*Journal of Micromechanics and Microengineering*, 8(3): 243-249
- [3]. [Residual-stress relaxation in polysilicon thin films by high-temperature rapid thermal annealing](#)  
**X. Zhang**, T-Y Zhang, M. Wong, Y. Zohar  
*Sensors and Actuators A: Physical*, 64(1): 109-115
- [2]. [Investigation on the 1000, 1150 and 1400  \$^{\circ}\text{C}\$  isothermal section of the Ti-Al-Nb system](#)  
G.L. Chen, X.T. Wang, K.Q. Ni, S.M. Hao, J.X. Cao, J.J. Ding, and **X. Zhang**  
*Intermetallics*, 4(1): 13-22
- [1]. [Calculation of phase equilibria for the ternary system by the grand potential method](#)  
S.M. Hao and **X. Zhang**  
*Journal of Phase Equilibria*, 16(5): 441-446