Ye Cao

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Imaging and Nanoscale Characterization Group
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Education

Shanghai Jiao Tong University, Shanghai, China	Materials Science and Engineering,	B.A., 2005
Shanghai Jiao Tong University, Shanghai, China	Materials Science and Engineering,	M.A., 2008
The Pennsylvania State University, PA, USA	Materials Science and Engineering,	Ph.D., 2014
	Adviser: **Prof. Long-Qing Chen**	

Professional Experience and Service

2014-p Postdoctoral Research Associate, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, Oak Ridge, TN. Adviser: **Dr. Sergei V. Kalinin**

2013.06-08 Researcher, Computational Chemistry and Materials Science, Lawrence Livermore National Laboratory, Livermore, CA. Adviser: Dr. Patrice Turchi and Dr. Jean-Luc Fattebert

2014-2015 Reviewer: Nature Communications, Acta Materialia, Journal of Materials Chemistry C, Applied Physics Letters, Journal of Applied Physics, AIP Advances, Ceramic International

2012.11 Symposium Chair "*Multi-scale Simulations of Systems Undergoing Phase-change: Mesoscopic View*" in 2012 MRS Fall Meeting & Exhibit, Boston, MA

Honors and Awards

2013 Robert E. Newnham Award for Research Excellence, Penn State
2013 Student Poster Award, Lawrence Livermore National Laboratory
2012 Gold Medal on Poster Competition, 2012 MRS Fall Meeting & Exhibit, Boston, MA

Research Synopsis

1. Phase-field modeling of ionic/electronic conduction in ferroelectric oxides
   Coupling of phase-field model for ferroelectric polarization and defect transport equations for ionic conduction, dielectric breakdown of capacitors and the current-voltage characteristics in diode/rectifier devices.

2. Ferroelectric domain structure and switching characterized by Piezoresponse Force Microscopy
   Electrostatic and electromechanical interactions, ferroelectric switching, flexoelectricity, dislocation pinning and domain wall conduction in nanoscale ferroelectric perovskites (PZT, BFO, BTO etc.)

3. Solidification in binary alloy
   Phase-field model for U-Zr alloy based on realistic thermodynamic and kinetic materials data to study the phase stability, miscibility gaps and spinodal decomposition linking to CALPHAD database

Publications List:

1. Rama K. Vasudevan, Hamidreza Khassaf, **Ye Cao**, Shujun Zhang, Alexander Tselev, Ben Carmichael, M. Baris Okatan, Stephen Jesse, Long-Qing Chen, S. Pamir Alpay, Sergei V. Kalinin and Nazanin Bassiri-Gharb, "Acoustic Detection of Phase Transitions on the Nanoscale" ***Advanced Functional Materials*** 26, 478–486 , (2016)
2. David Edwards, Yaser Bastani, **Ye Cao**, Stephen Jesse, Long-Qing Chen, S.V. Kalinin, Amit Kumar and Nazanin Bassiri-Gharb, "Local probing of ferroelectric and ferroelastic switching through stress-mediated piezoelectric spectroscopy", ***Advanced Materials Interface*** DOI: 10.1002/admi.201500470 (2016)
3. G. P. Cao, **Y. Cao**, H.B. Huang, L.Q. Chen, and X.Q. Ma, "Analysis of Multi-domain Ferroelectric Switching in $BiFeO_3$ Thin Film Using Phase-field Method", ***Computational Materials Science*** 115, 208-213, (2016)
4. Jian-Jun Wang, Hou-Bing Huang, Thorsten J M Bayer, Ali Moballegh, **Ye Cao**, Andreas Klein, Elizabeth C. Dickey, Douglas L. Irving, C. A. Randall, Long-Qing Chen, "Defect Chemistry and Resistance Degradation in Fe-doped $SrTiO_3$ Single Crystal", accepted by ***Acta Materialia***
5. **Ye Cao**, Jie Shen, Clive Randall and Long-Qing Chen, "Effect of multi-domain structure on ionic transport, electric potential and current evolution in $BaTiO_3$ ferroelectric capacitor", submitted to ***Acta Materialia***
6. Alexander Tselev, Pu Yu, **Ye Cao**, Liv R. Dedon, Lane W. Martin, Long-Qing Chen, Sergei V. Kalinin and Petro Maksymovych, "Microwave ac conductivity of domain walls in ferroelectric thin films", submitted to ***Nature Communication***
7. Q. Li*, **Y. Cao***, P. Yu, R.K. Vasudevan, N. Laanait, A. Tselev, F. Xue, L.Q. Chen, P. Maksymovych, S.V. Kalinin and N. Balke, "Giant elastic tunability in strained $BiFeO_3$ near an electrically-induced phase transition", ***Nature Communication***, 6, 6985, (2015)
8. **Y. Cao**, Q. Li, L.Q. Chen and S.V. Kalinin, "Coupling of electrical and mechanical switching in nanoscale ferroelectrics", ***Appl. Phys. Lett.*** 107, 202905 (2015)
9. **Y. Cao**, Anton V. Ievlev, A. N. Morozovska, L.Q. Chen, S. V. Kalinin and P. Maksymovych, "Intrinsic space charge layers and field enhancement in ferroelectric nanojunctions", ***Appl. Phys. Lett.***, 107, 022903 (2015)
10. Peter Maksymovych, **Ye Cao**, Stephen Jesse, Mark Huijben, Guus Rijnders, Dave H. A. Blank, Arthur P. Baddorf, Long-Qing Chen and Sergei V. Kalinin, "Electronic Switching by Metastable Polarization States in $BiFeO_3$", to be submitted

11. **Y. Cao**, J. Shen, C. A. Randall and L.Q. Chen, "Effect of ferroelectric polarization on ionic transport and resistance degradation behavior in single crystal $BaTiO_3$ by phase-field approach" ***J. Am. Ceram. Soc***. 97, 11, (2014)
12. K. Song, C.T. Koch, D.Y. Kim, J.K. Kim, W.Y. Jeong, C.G Park, **Y. Cao**, T.N. Yang, L.Q. Chen, and S.H. Oh "Correlative high resolution mapping of strain and charge density in a strained piezoelectric multilayer" ***Advanced Materials Interface***, 2, 1400281, (2014)
13. **Y. Cao**, J. Shen, C. A. Randall and L.Q. Chen, "Phase-field modeling of switchable diodelike current-voltage characteristics in ferroelectric $BaTiO_3$", ***Appl. Phys. Lett.***, 104, 182905 (2014)
14. **Y. Cao**, S. Bhattacharya, J. Shen, C. A. Randall and L.Q. Chen, "Role of polaron hopping in leakage current behavior of a $SrTiO_3$ single crystal", ***J. Appl. Phys.*** 114, 224102, (2013)
15. J.K. Lee, G.Y. Shin, K. Song, W.S. Choi, Y.A. Shin, S.Y. Park, J. Britson, **Y. Cao**, L.Q. Chen, H.N. Lee and S.H. Oh, "Direct Observation of Asymmetric Domain Wall Motion in a Ferroelectric Capacitor", ***Acta Materialia***, 61, 6765–6777 (2013)
16. E. Strelcov, Y. Kim, S. Jesse, **Y. Cao**, I. N. Ivanov, I. I. Kravchenko, C.-H. Wang, Y.-C. Teng, L.Q. Chen, Y. H. Chu and S. Kalinin "Probing Local Ionic Dynamics in Functional Oxides at the Nanoscale", ***Nano Lett***., 13, 3455−3462, (2013)
17. T.V. Thanh, J.W. Chen, P.C. Huang, B.C. Huang, **Y. Cao**, C.H. Yeh, H.J. Liu, E.A. Eliseev, A.N. Morozovska, J.Y. Lin, Y.C. Chen, M.W. Chu, P.W. Chiu, Y.P. Chiu, L.Q. Chen, C.L. Wu and Y.H. Chu, "Ferroelectric control of the conduction at the $LaAlO_3/SrTiO_3$ hetero-interface" ***Advanced Materials***, 25, 3357–3364, (2013)
18. F. Xue, J.J. Wang, G. Sheng, E. Huang, **Y. Cao**, H.H. Huang, P. Munroe, R. Mahjoub, Y.L. Li, V. Nagarajan and L.Q. Chen, "Phase field simulations of ferroelectrics domain structures in $PbZr_xTi_{1-x}O_3$ bilayers", ***Acta Materialia***, 61 (2013) 2909–29188
19. **Y. Cao**, G. Sheng, J.X. Zhang, S. Choudhury, Y.L. Li, C.A. Randall and L.Q. Chen, "Piezoelectric response of single-crystal $PbZr_{1-x}Ti_xO_3$ near morphotropic phase boundary predicted by phase-field simulation", ***Appl. Phys. Lett***., 97, 252904, (2010)
20. **Y. Cao**, N. Zhong, X.D. Wang, B.X. Huang and Y.H. Rong, "An Edge-to-Edge Matching Model and Its Applications to the HCP/FCC System", ***Journal of Shanghai Jiao Tong University*** (Science), (2006)