

Bayrammurad (Bayram) Saparov

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PROFESSIONAL APPOINTMENTS

Assistant Professor **2016-present**
University of Oklahoma, Norman, OK, USA

EDUCATION/RESEARCH POSITIONS

DOE EERE SunShot Postdoctoral Fellow **2014-2016**
Duke University, NC, USA
Advisor: Dr. David B. Mitzi

Postdoctoral Research Associate **2011-2014**
Oak Ridge National Laboratory, TN, USA
Advisors: Dr. Athena S. Sefat, Dr. Brian C. Sales

Doctor of Philosophy in Chemistry **2006-2011**
University of Delaware, DE, USA
Advisor: Dr. Svilen Bobev

Diploma in Chemistry **2001-2006**
Moscow State University named after M. V. Lomonosov, Moscow, Russia
Advisor: Dr. Boris A. Popovkin

AWARDS AND HONORS

- The 2014 US Department of Energy (DOE) Energy Efficiency & Renewable Energy (EERE) SunShot Postdoctoral Research Award
- The 2011 Bill N. Baron Fellowship Award for contribution to renewable energy research and development
- The 2010 ICDD (International Centre for Diffraction Data) Ludo Frevel Scholarship
- The 2010 Brennie E. Hackley Jr. Award for Excellence in Research
- The 2010 Trofimenko Memorial Prize for creative inorganic synthesis
- The 2007-2008 University of Delaware Elizabeth Dyer Award for excellence in teaching
- Outstanding University Graduate Fellow Award for the 2009-2010 academic year
- Bronze Medal in the 35th (2001) International Mendeleev School Chemistry Olympiad
- Gold Medal in the 2001 Turkmenistan National Chemistry Olympiad
- Gold Medal in the 2000 Turkmenistan National Chemistry Olympiad

TEACHING EXPERIENCE

CHEM5300 (*Intermediate Inorganic Chemistry*) Fall 2016

PROFESSIONAL MEMBERSHIPS AND SERVICE

- American Chemical Society (ACS)
- American Physical Society (APS)
- Reviewer for *Nature Reviews Materials*, *J. Am. Chem. Soc.*, *Chem. Mater.*, *Inorg. Chem.*, *J. Phys. Chem.*, *J. Solid State Chem.*, *Z. Anorg. Allg. Chem.*, *Semicond. Sci. Technol.*, *J. Phys. D: Appl. Phys.*, *J. Phys.: Condens. Matter*, *Phys. Status Solidi RRL*, *Phys. Rev. B* and *Phys. Rev. Lett.*

COMMUNITY SERVICE

- Coach for National Institutes of Health (NIH) BOOST (Building Opportunities and Overtures in Science and Technology) program, a STEM program aimed at improving the science performance of underrepresented minority students
- Judge at the 2015 North Carolina Science Olympiad
- Judge at the 2014 Triad Math and Science Academy STEM Fair
- Volunteer presenter at the 2012 Oak Ridge National Laboratory Secret City Science Festival
- Judge at the 2010 Chesapeake Science point (CSP) Science Fair
- Judge at the 2009 Chesapeake Science point (CSP) Science Fair

FUNDED RESEARCH GRANTS

- Author (PI) of a DOE SunShot Postdoctoral Research grant, “Development of Stable Lead-Free High Performance Photovoltaic Materials”, ~\$200K, 2014 – 2016
- Co-author of a National Science Foundation (NSF) Energy for Sustainability (14-7644) grant, “Defect Engineering in Zinc Blende-Type Absorbers”, \$300K, 2015 – 2018
- Co-author of a Duke University Energy Research Seed Funding grant, “Defect Engineering in Photovoltaic Materials”, \$38K, 2015 – 2016

INVITED TALKS AND ORAL PRESENTATIONS IN CONFERENCES

*Indicates participation as an invited speaker

- *Lehigh University Seminar, Bethlehem, PA **2016**
- *The University of Oklahoma Seminar, Norman, OK **2016**
- *Lumenari, Inc. Seminar, Lexington, KY **2016**
- *Lawrence Tech University Seminar, Southfield, MI **2016**
- *Bradley University Seminar, Peoria, IL **2016**
- *Bucknell University Seminar, Lewisburg, PA **2015**
- *Joint Southeastern/Southwest Regional Meeting, Memphis, TN **2015**
- *University of South Carolina Seminar, Columbia, SC **2014**
- *University of Alabama Seminar, Tuscaloosa, AL **2013**
- *Wesleyan University Seminar, Middletown, CT **2013**
- *University of Houston Seminar, Houston, TX **2013**
- *The American Conference on Crystal Growth & Epitaxy, Keystone, CO **2013**
- *University of Houston, Downtown, Seminar, Houston, TX **2013**
- *University of South Carolina Seminar, Columbia, SC **2012**
- *National High Magnetic Field Laboratory Seminar, Tallahassee, FL **2012**
- American Physical Society (APS) March Meeting, Boston, MA **2012**
- The 37th Annual Silver Symposium, University of Delaware, Newark, DE **2010**
- American Chemical Society (ACS) National Meeting, Washington, DC **2009**
- American Chemical Society (ACS) National Meeting, Philadelphia, PA **2008**
- Mid-Atlantic Seaboard – Inorganic Symposium (MAS-IS), Newark, DE **2008**

PUBLICATIONS

*Denotes articles as the corresponding author.

#Denotes co-first author articles with equal contribution.

Cover articles, invited articles, and the articles designated to be very important by the editors are highlighted in brackets.

44. “*BaCu₂Sn(S,Se)₄: Earth-abundant quaternary chalcogenides for thin-film photovoltaics*”
Shin, D. #; **Saparov, B.**#; Zhu, T.; Huhn, W. P.; Blum, V.; Mitzi, D. B. *Chem. Mater.* **2016**, 28, 4471-4780.
43. “*Tetragonal and collapsed-tetragonal phases of CaFe₂As₂: A view from angle-resolved photoemission and dynamical mean-field theory*”
Van Roekeghem, A.; Richard, P.; Shi, X.; Wu, S.; Zeng, L.; **Saparov, B.**; Ohtsubo, Y.; Qian, T.; Sefat, A. S.; Biermann, S.; Ding, H. *Phys. Rev. B.* **2016**, 93, 245139.
42. “*Photovoltaic properties of two-dimensional (CH₃NH₃)₂Pb(SCN)₂I₂ perovskite: a combined experimental and density-functional theory study*”
Xiao, Z.; Meng, W.; **Saparov, B.**; Duan, H.-S.; Wang, C.; Feng, C.; Liao, W.; Ke, W.; Zhao, D.; Wang, J.; Mitzi, D. B.; Yan, Y. *J. Phys. Chem. Lett.* **2016**, 7, 1213-1218.
41. “*Organic-inorganic perovskites: Structural versatility for functional materials design*”
Saparov, B.; Mitzi, D. B. *Chem. Rev.* **2016**, 116, 4558-4596.
40. “*Employing lead thiocyanate additive to reduce the hysteresis and boost the fill factor of planar perovskite solar cells*”
Ke, W.; Xiao, C.; Wang, C.; **Saparov, B.**; Duan, H.-S.; Zhao, D.; Xiao, Z.; Schulz, P.; Harvey, S. P.; Liao, W.; Meng, W.; Yu, Y.; Cimaroli, A. J.; Jiang, C.-S.; Zhu, K.; Al-Jassim, M.; Fang, G.; Mitzi, D. B.; Yan, Y. *Adv. Mater.* **2016**, 28, 5214-5221.
39. “*Thin-film deposition and characterization of a Sn-deficient perovskite derivative Cs₂SnI₆*”
Saparov, B.; Sun, J.-P.; Meng, W.; Xiao, Z.; Duan, H.-S.; Gunawan, O.; Shin, D.; Hill, I. G.; Yan, Y.; Mitzi, D. B. *Chem. Mater.* **2016**, 28, 2315-2322.
38. “*Viability of lead-free perovskites with mixed chalcogen and halogen anions for photovoltaic applications*”
Hong, F.; **Saparov, B.**; Meng, W.; Xiao, Z.; Mitzi, D. B.; Yan, Y. *J. Phys. Chem. C.* **2016**, 120, 6435-6441.
37. “*Alloying and defect control within chalcogenide perovskites for optimized photovoltaic application*”
Meng, W.; **Saparov, B.**; Hong, F.; Wang, J.; Mitzi, D. B.; Yan, Y. *Chem. Mater.* **2016**, 28, 821-829.
36. “*Thin-film preparation and characterization of Cs₃Sb₂I₉: A lead-free layered perovskite semiconductor*”
Saparov, B.; Hong, F.; Sun, J.-P.; Duan, H.-S.; Meng, W.; Cameron, S.; Hill, I. G.; Yan, Y.; Mitzi, D. B. *Chem. Mater.* **2015**, 27, 5622-5632. [ACS Editors’ Choice]
35. “*Pressure-induced structural phase transition in CeNi: X-ray and neutron scattering studies and first-principles calculations*”

- Mirmelstein, A.; Podlesnyak, A.; dos Santos, A. M.; Ehlers, G.; Kerbel, O.; Matvienko, V.; Sefat, A. S.; **Saparov, B.**; Halder, G. J.; Tobin, J. G. *Phys. Rev. B* **2015**, *92*, 054102.
34. “Direct spectroscopic evidence for completely filled Cu 3d shell in BaCu₂As₂ and α-BaCu₂Sb₂”
Wu, S. F.; Richard, P.; van Roekeghem, A.; Nie, S. M.; Miao, H.; Xu, N.; Qian, T.; **Saparov, B.**; Fang, Z.; Biermann, S.; Sefat, A. S.; Ding, H. *Phys. Rev. B* **2015**, *91*, 235109.
33. “Magnetic and structural transitions in La_{0.4}Na_{0.6}Fe₂As₂ single crystals”
Yan, J.-Q.; Nandi, S.; **Saparov, B.**; Čermák, P.; Xiao, Y.; Su, Y.; Jin, W. T.; Schneidewind, A.; Bruckel, Th.; McCallum, R. W.; Lograsso, T. A.; Sales, B. C.; Mandrus, D. G. *Phys. Rev. B* **2015**, *91*, 024501.
32. “Room-temperature Ba(Fe_{1-x}Co_x)₂As₂ is not tetragonal: Direct observation of magnetoelastic interactions in pnictide superconductors”
Cantoni, C.; McGuire, M. A.; **Saparov, B.**; May, A. F.; Keiber, T.; Bridges, F.; Sefat, A. S.; Sales, B. C. *Adv. Mater.* **2015**, *27*, 2715-2721.
31. “Robust antiferromagnetism preventing superconductivity in pressurized (Ba_{0.61}K_{0.39}Mn₂Bi₂)”
Gu, D.; Dai, X.; Le, C.; Sun, L.; Wu, Q.; **Saparov, B.**; Guo, J.; Gao, P.; Zhang, S.; Zhou, Y.; Zhang, C.; Jin, S.; Xiong, L.; Li, R.; Li, Y.; Li, X.; Liu, J.; Sefat, A. S.; Hu, J.; Zhao, Z. *Sci. Rep.* **2014**, *4*, 7342.
30. “Ferromagnetism of Fe₃Sn and alloys”
Sales, B. C.; **Saparov, B.**; McGuire, M. A.; Singh, D. J.; Parker, D. S. *Sci. Rep.* **2014**, *4*, 7024.
29. “Ternary chalcogenides Cs₂Zn₃Se₄ and Cs₂Zn₃Te₄: Potential p-type transparent conducting materials”
Shi, H.; **Saparov, B.**; Singh, D. J.; Sefat, A. S.; Du, M.-H. *Phys. Rev. B* **2014**, *90*, 184104.
28. “Cu substitution effects on the local magnetic properties of Ba(Fe_{1-x}Cu_x)₂As: a site-selective ⁷⁵As and ⁶³Cu NMR study”
Takeda, H.; Imai, T.; Tachibana, M.; Gaudet, J.; Gaulin, B. D.; **Saparov, B.**; Sefat, A. S. *Phys. Rev. Lett.* **2014**, *113*, 117001.
27. “Annealing effects on the properties of BFe₂As₂ (B = Ca, Sr, Ba) superconducting parents”
Saparov, B.*; Sefat, A. S. *Dalton Transactions* **2014**, *43*, 14971-14975. [Invited paper]
26. “Fermi-Surface Reconstruction and Complex Phase Equilibria in CaFe₂As₂”
Gofryk, K.; **Saparov, B.**; Durakiewicz, T.; Chirkina, A.; Danzenbacher, S.; Vyalikh, D. V.; Graf, M. J.; Sefat, A. S. *Phys. Rev. Lett.* **2014**, *112*, 186401.
25. “Synthesis, crystal structure, and electronic properties of the CaRE₃SbO₄ and Ca₂RE₈Sb₃O₁₀ phases (RE is a rare-earth metal)”
Forbes, S.; Yuan, F.; **Saparov, B.**; Sefat, A. S.; Kosuda, K.; Kolodiazhnyi, T.; Mozharivskyj, Y. *Chem. Mater.* **2014**, *26*, 2289-2298.
24. “Complex structures of different CaFe₂As₂ samples”
Saparov, B.*; Cantoni, C.; Pan, M.; Hogan, T. C.; Ratcliff II, W.; Wilson, S. D.; Fritsch, K.; Gaulin, B. D.; Sefat, A. S. *Sci. Rep.* **2014**, *4*, 4120.
23. “Magnetic structure and spin excitations in BaMn₂Bi₂”

- Calder, S.; **Saparov, B.**; Cao, H.; Niedziela, J.; Lumsden, M. D.; Sefat, A. S.; Christianson, A. D. *Phys. Rev. B* **2014**, *89*, 064417.
22. “Local inhomogeneity and filamentary superconductivity in Pr-doped CaFe_2As_2 ”
Gofryk, K.; Pan, M.; Cantoni, C.; **Saparov, B.**; Mitchell, J. E.; Sefat, A. S. *Phys. Rev. Lett.* **2014**, *112*, 047005.
21. “Absence of structural transition in $\text{M}_{0.5}\text{IrTe}_2$ ($M = \text{Mn}, \text{Fe}, \text{Co}, \text{Ni}$)”
Yan, J.-Q.; **Saparov, B.**; Sefat, A. S.; Yang, H.; Cao, H. B.; Zhou, H. D.; Sales, B. C.; Mandrus, D. G. *Phys. Rev. B* **2013**, *88*, 134502.
20. “Crystal, magnetic, and electronic structures, and properties of new BaMnPnF ($\text{Pn} = \text{As}, \text{Sb}, \text{Bi}$)”
Saparov, B.*; Singh, D. J.; Garlea, V. O.; Sefat, A. S. *Sci. Rep.* **2013**, *3*, 2154.
19. “Crystals, magnetic and electronic properties of a new ThCr_2Si_2 -type BaMn_2Bi_2 and K-doped compositions”
Saparov, B.*; Sefat, A. S. *J. Solid State Chem.* **2013**, *204*, 32-39.
18. “Temperature-composition phase diagrams for $\text{Ba}_{1-x}\text{Sr}_x\text{Fe}_2\text{As}_2$ ($0 \leq x \leq 1$) and superconducting $\text{Ba}_{0.5}\text{Sr}_{0.5}(\text{Fe}_{1-y}\text{Co}_y)_2\text{As}_2$ ($0 \leq y \leq 0.141$)”
Mitchell, J. E.; **Saparov, B.**; Lin, W.; Calder, S.; Li, Q.; Kalinin, S. V.; Pan, M.; Christianson, A. D.; Sefat, A. S. *Phys. Rev. B* **2012**, *86*, 174511.
17. “Crystal and electronic structures of metallic $\text{Ba}_2\text{Pd}_5\text{Ge}_4$ ”
Saparov, B.*; Parker, D. S.; Sefat, A. S. *Dalton Transactions* **2012**, *41*, 12920-12925.
16. “Properties of binary transition-metal arsenides (TAs)”
Saparov, B.; Mitchell, J. E.; Sefat, A. S. *Supercond. Sci. Technol.* **2012**, *25*, 084016.
15. “Metallic properties of $\text{Ba}_2\text{Cu}_3\text{P}_4$ and BaCu_2Pn_2 ($\text{Pn} = \text{As}, \text{Sb}$)”
Saparov, B.*; Sefat, A. S. *J. Solid State Chem.* **2012**, *191*, 213-219. [Cover article]
14. “Effect of molybdenum 4d hole substitution in BaFe_2As_2 ”
Sefat, A. S.; Marty, K.; Christianson, A. D.; **Saparov, B.**; McGuire, M. A.; Lumsden, M. D.; Tien, W.; Sales, B. C. *Phys. Rev. B* **2012**, *85*, 024503.
13. “Spin glass and semiconducting behavior in one-dimensional $\text{BaFe}_{2-\delta}\text{Se}_3$ ($\delta \approx 0.2$) crystals”
Saparov, B.*; Calder, S.; Sipos, B.; Cao, H.; Chi, S.; Singh, D. J.; Christianson, A. D.; Lumsden, M. D.; Sefat, A. S. *Phys. Rev. B* **2011**, *84*, 245132.
12. “Synthesis, crystal structures and properties of the Zintl phases Sr_2ZnP_2 , Sr_2ZnAs_2 , A_2ZnSb_2 and A_2ZnBi_2 ($A = \text{Sr}, \text{Eu}$)”
Wilson, D. K.; **Saparov, B.**; Bobev, S. Z. *Anorg. Allg. Chem.* **2011**, *637*, 2018-2025.
11. “Syntheses, and crystal and electronic structures of the new Zintl phases $\text{Na}_2\text{ACdSb}_2$ and K_2ACdSb_2 ($A = \text{Ca}, \text{Sr}, \text{Ba}, \text{Eu}, \text{Yb}$): structural relationship with Yb_2CdSb_2 and the solid solutions $\text{Sr}_{2-x}\text{A}_x\text{CdSb}_2$, $\text{Ba}_{2-x}\text{A}_x\text{CdSb}_2$ and $\text{Eu}_{2-x}\text{Yb}_x\text{CdSb}_2$ ”
Saparov, B.; Saito, M.; Bobev, S. *J. Solid State Chem.* **2011**, *184*, 432-440.
10. “Pentaeuropium dicadmium pentaantimonide oxide, $\text{Eu}_5\text{Cd}_2\text{Sb}_5\text{O}$ ”
Saparov, B.; Bobev, S. *Acta Cryst. E* **2011**, *E67*, i11.

9. “Synthesis, crystal and electronic structures of the new quaternary phases $A_5Cd_2Sb_5F$ ($A=Sr, Ba, Eu$), and $Ba_5Cd_2Sb_5O_x$ ($0.5 < x < 0.7$)”
Saparov, B.; Bobev, S. *Dalton Transactions* **2010**, 39, 11335-11343. [Cover article]
8. “Isolated $^1 [ZnPn_2]^{4-}$ chains in the Zintl phases Ba_2ZnPn_2 ($Pn=As, Sb, Bi$ -Synthesis, Structure, and Bonding)”
Saparov, B.; Bobev, S. *Inorg. Chem.* **2010**, 49, 5173-5179.
7. “Undecaeuropium hexazinc dodecaarsenide, $Eu_{11}Zn_6As_{12}$ ”
Saparov, B.; Bobev, S. *Acta Cryst. E* **2010**, E66, i24.
6. “Synthesis, crystallographic and theoretical studies of the new Zintl phases $Ba_2Cd_2Pn_3$ ($Pn=As, Sb$), and the solid solutions $Ba_2Cd_2Sb_xAs_{3-x}$ and $Ba_{2-x}Sr_xCd_2As_3$ ”
Saparov, B.; He, H.; Zhang, X.; Greene, R.; Bobev, S. *Dalton Transactions* **2010**, 39, 1063-1070.
5. “New quaternary Zintl phases – Syntheses, crystal and electronic structures of $KA_2Cd_2Sb_3$ ($A=Ca, Sr, Ba, Eu, Yb$)”
Saparov, B.; Broda, M.; Ramanujachary, K. V.; Bobev, S. *Polyhedron* **2010**, 29, 456-462.
4. “Synthesis, Structure, and Bonding of the Zintl Phase $Ba_3Cd_2Sb_4$ ”
Saparov, B.; Xia, S.- Q.; Bobev, S. *Inorg. Chem.* **2008**, 47, 11237-11244.
3. “Synthesis, structure and physical properties of the new Zintl phases $Eu_{11}Zn_6Sb_{12}$ and $Eu_{11}Cd_6Sb_{12}$ ”
Saparov, B.; Bobev, S.; Ozbay, A.; Nowak, E. R. *J. Solid State Chem.* **2008**, 181, 2690-2696.
2. “Zinc-deficiency in intermetallics with the $NaZn_{13}$ type. Re-determination of the crystal structure and physical properties of $EuZn_{13-x}$ ($x=0.25(1)$)”
Saparov, B.; Bobev, S. *J. Alloys and Compounds* **2008**, 463, 119-123.
1. “catena-Poly[[[bis(cyclohexyldiphenylphosphine- $[\kappa]P$)silver(I)]- $[\mu]$ -cyano- $[\kappa]2N:C$ -silver(I)- $[\mu]$ -cyano- $[\kappa]2C:N$] dichloromethane solvate]”
Xie, X.; **Saparov, B.;** Yap, G. P. A. *Acta Cryst. E* **2007**, 63, 7.