

Xiaoyan Tan

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George Mason University, 4400 University Dr., Fairfax, VA, USA, 22030

Education

Ph.D. Chemistry, 8/2011 – 2/2016

Department of Chemistry and Biochemistry, Florida State University, Tallahassee, FL, USA

Dissertation Title: Synthesis and Investigation of Ternary Intermetallics as Itinerant Magnets

Advisor: Prof. Michael Shatruk

M.S. Inorganic Chemistry, 9/2008 – 7/2011

Department of Chemistry, University of Science and Technology of China, Hefei, China

Thesis Title: Synthesis and Growth Mechanism of γ -In₂Se₃ via Solution Method

Advisor: Prof. Qing Yang

B.S. Applied Chemistry, 9/2004 – 7/2008

Department of Applied Chemistry, Hefei University of Technology, Hefei, China

Professional Experience/Appointments

Assistant Professor

Department of Chemistry & Biochemistry, George Mason University, August 25, 2018 - Present

Research Experience

Post-Doctoral Fellow 3/2016-07/2018

Department of Chemistry & Chemical Biology, Rutgers, the State University of New Jersey, NJ, USA

Advisor: Prof. Martha Greenblatt,

- Preparation and characterization of thermoelectric properties, of ternary transition metal pnictides, selenides, and other novel thermoelectric materials.
- Investigation of structure and physical properties of highly distorted perovskite-related oxides and polar multiferroic oxides using high pressure and high temperature techniques.

Graduate Research Assistant 8/2011 – 2/2016

Department of Chemistry and Biochemistry, Florida State University, Tallahassee, FL, USA

Advisor: Prof. Michael Shatruk

- Growth of large single crystals of ternary and quaternary rare-earth transition metal pnictides.
- Studied the structure, valence change, and magnetic properties under chemical and physical pressure on layered rare-earth transition metal pnictides.
- Discovered magnetocaloric effect in ternary and quaternary transition metal borides.

Graduate Research Scientist 2014, 2015

Oak Ridge National Laboratory (ORNL), Oak Ridge, TN, USA, May-June, 2014, March-April, 2015

Ph. D. co-advisor: Dr. V. Ovidiu Garlea

- Performed neutron scattering experiments on single crystals and polycrystalline sample of rare-earth transition metal pnictides.
- Analyzed neutron scattering data and solved magnetic structures to reveal the interplay between magnetic ordering in 3d and 4f sublattices.

Graduate Research Assistant 9/2008 – 7/2011

Department of Chemistry, University of Science and Technology of China, Hefei, China

Advisor: Prof. Qing Yang

- Studied the synthesis, synthetic mechanism, morphology, and optical and electrical properties inorganic nanomaterials such as indium selenide.

Publications

16. Frank, C. E.; McCabe, E. E.; Orlandi, F.; Manuel, P.; Tan, X.; Deng, Z.; Croft, M.; Cascos V. A.; Emge, T. J.; Feng, H.; Lapidus, S. H.; Jin, C.; Wu, M.; Li, M.-R.; Ehrlich, S.; Khalid, S.; Quackenbush, N.; Yu, S.; Walker, D.; Greenblatt, M. *Mn₂CoReO₆: A robust multisublattice antiferromagnetic perovskite with small A-site cations*. *Chem. Commun.* **2019**, 55, 3331-3334.
15. Tan, X.; Stephens, P. W.; Hendrickx, M.; Hadermann, J.; Segre, C.U.; Croft, M.; Kang, C.-J.; Deng, Z.; Saul Lapidus, S. H.; Kim, S. W.; Jin, C.; Kotliar, G.; Martha Greenblatt, M. *Tetragonal Cs_{1.17}In_{0.81}Cl₃: a charge-ordered indium halide perovskite derivative*. *Chem. Mater.* **2019**, 31, 1981-1989.
14. Tan, X.; McCabe, E. E.; Orlandi, F.; Manuel, P.; Batuk, M.; Hadermann, J.; Deng, Z.; Jin, C.; Nowik, I.; Herber, R.; Segre, C. U.; Liu, S.; Croft, M.; Kang, C.-J.; Lapidus, S. H.; Frank, C. E.; Padmanabhan, H.; Gopalan, V.; Wu, M.; Li, M.-R.; Kotliar, G.; Walker, D.; Greenblatt, M. *MnFe_{0.5}Ru_{0.5}O₃: an above-room-temperature antiferromagnetic semiconductor*. *J. Mater. Chem. C* **2019**, 7, 509-522.
13. Tan, X.; Devlin, K. P.; Deng, X.; Kang, C.-J.; Croft M.; Frank, C. E.; Pak, C.; Lapidus, S.; Kauzlarich, S. M.; Taufour, V.; Kotliar, B.; Greenblatt, M. *Thermoelectric properties of CoAsSb: an experimental and theoretical study*. *Chem. Mater.* **2018**, 30, 4207-4215.
12. Tan, X.; Tener, Z.; Shatruk, M. *Correlating itinerant magnetism in RCo₂Pn₂ pnictides (R = La, Ce, Nd, Pr, Eu, Ca; Pn =P, As) to their crystal and electronic structures*, *Acc. Chem. Res.* **2018**, 51, 230-239.
11. Tan, X.; Garlea, O. V.; Kovnir, K.; Thompson, C. M.; Xu, T.; Cao, H. B.; Chai, P.; Tener, Z.; Yan, Shi.; Xiong, P.; Shatruk, M. *Complex magnetic phase diagram with multistep spin-flop in La_{0.25}Pr_{0.75}Co₂P₂*. *Phys. Rev. B*, **2017**, 95, 024428.
10. Menushenkov, A. P.; Yaroslavtsev, A. A.; Geondzhian, A. Y.; Chernikov, R. V.; Nataf, L.; Shatruk, M.; Tan, X. *Driving the europium valence state in EuCo₂As₂ by external and internal impact*. *J. Supercond. Novel Magn.* **2017**, 30, 75-78.
9. Tan, X.; Yaroslavtsev, A. A.; Cao, H. B.; Menuschenkov, A. P.; Chernikov, R. V.; Nataf, L.; Garlea, O. V.; Shatruk, M. *Controlling magnetic ordering in Ca_{1-x}Eu_xCo₂As₂ under chemical compression*. *Chem. Mater.*, **2016**, 28, 7459-7469.
8. Tan, X.; Fabbris, G.; Haskel, D.; Yaroslavtsev, A. A.; Cao, H. B.; Thompson, C. M.; Kovnir, K.; Menuschenkov, A. P.; Chernikov, R. V.; Garlea, V. O.; Shatruk, M. *A Transition from localized (4f) to strongly correlated (3d) electron behavior driven by pressure, chemical compression, or electron doping in ACo₂As₂ (A= Eu, Ca)*. *J. Am. Chem. Soc.* **2016**, 138, 2724-2731.
7. Tan, X.; Garlea, O. V.; Chai, P.; Geondzhian, A. Y.; Yaroslavtsev, A. A.; Menuschenkov, A. P.; Chernikov, R. V.; Shatruk, M. *Synthesis, crystal structure, and magnetism of R₂Co₁₂As₇ (R= Ca, Y, Ce-Yb)*. *J. Solid State Chem.* **2016**, 236, 147-158.
6. Chai, P.; Stoian, S. A.; Tan, X.; Dube, P. A.; Shatruk, M. *Investigation of magnetic properties and electronic structure of layered-structure borides AlT₂B₂ (T = Fe, Mn, Cr) and AlFe_{2-x}Mn_xB₂*. *J. Solid State Chem.* **2015**, 224, 52-61.
5. Menushenkov, A. P.; Yaroslavtsev, A. A.; Geondzhian, A. Y.; Chernikov, R. V.; Zubavichus, Y. V.; Tan, X.; Kovnir, K.; Shatruk, M. *Local electronic and crystal structure of magnetic RCo₂As₂ (R = La, Ce, Pr, Eu)*. *J. Supercond. Novel Magn.* **2015**, 28, 995-997.
4. Thompson, C. M.; Tan, X.; Garlea, O. V.; Gippius, A.; Yaroslavtsev, A. A.; Menushenkov, A. P.; Chernikov, R. V.; Büttgen, N.; Krätschmer, W.; Zubavichus, Y. V.; Shatruk, M. *Synthesis, structures, and magnetic properties of rare-earth cobalt arsenides, RCo₂As₂ (R = La, Ce, Pr, Nd)*. *Chem. Mater.* **2014**, 26, 3825-3837.

3. Cross, J.; Villa, E.; Darling, V.; Polinski, M.; Lin, J.; Tan, X.; Kikugawa, N.; Baumbach, R.; Shatruk, M.; Albrecht-Schmitt, T. *Straightforward reductive routes to air-stable uranium(III) and neptunium(III) materials*. *Inorg. Chem.* **2014**, *53*, 7455-7466.
2. Tan, X.; Chai, P.; Thompson, C. M.; Shatruk, M. *Magnetocaloric effect in $AlFe_2B_2$: Towards magnetic refrigerants from earth-abundant elements*. *J. Am. Chem. Soc.* **2013**, *135*, 9553-9557.
1. Tan, X.; Zhou, J.; Yang, Q. *Ascorbic acid-assisted solvothermal growth of γ - In_2Se_3 hierarchical flowerlike architectures*. *CrystEngComm*, **2011**, *13*, 2792-2798.

Patented Inventions

1. Abramchuk, M., Tan, X., & Shatruk, M. (submitted). *Magnetocaloric regenerators comprising materials containing cobalt, manganese and boron*. BASF, Florida State University. Tallahassee, FL.
2. Shatruk, M., Tan, X., & Chai, P. (2016). *Method for tuning the ferromagnetic ordering temperature of aluminum iron boride*. WO 2016122856 A1 20160804, Florida State University. Tallahassee, FL.

Presentations

- 08/21/2017, American Chemical Society National Meeting and Exposition, Washington, DC
Oral Presentation: Tan, X., & Shatruk, M. "*Itinerant ferromagnetism driven by physical and chemical compression in $Ca_{1-x}Eu_xCo_2As_2$* "
- 05/22/2015, North American Solid State Chemistry Conference (NASSCC), Tallahassee, FL
Oral Presentation: Tan, X., & Shatruk, M. "*Pressure-Induced Mixed Valence and Antiferromagnetic to Ferromagnetic Phase Transition in $EuCo_2As_2$* "
- 09/26/2014, Florida Inorganic and Materials Symposium (FIMS), Gainesville, FL
Oral Presentation: Tan, X., & Shatruk, M. "*Interplay of Mixed Valence and Magnetism in $ThCr_2Si_2$ -type pnictides*"
- 07/29/2014, Gordon Research Conference on Solid State Chemistry (GRC), New London, NH
Poster Presentation: Tan, X., Thompson, C. M., Chai, P., Kovnir, K., Xu, T., Xiong, P., & Shatruk, M. "*Spin-Flop transitions in ternary rare-earth cobalt pnictides*"
- 11/14/2013, ACS Southeastern Regional Meeting, Atlanta, GA
Oral Presentation: Tan, X., Thompson, C. M., Kovnir, K., & Shatruk, M. "*Synthesis of rare-earth cobalt arsenides from Bi flux*"
- 06/25/2013, North American Solid State Chemistry Conference (NASSCC), Corvallis, OR
Poster Presentation: Tan, X., Thompson, C. M., Kovnir, K., & Shatruk, M. "*Synthesis and magnetic properties of rare-earth cobalt arsenides, RCo_2As_2* "
- 09/28/2012, Florida Inorganic and Materials Symposium (FIMS), Gainesville, FL
Poster Presentation: Tan, X., Chai, P., & Shatruk, M. "*Magnetic ordering and magnetocaloric effect in $AlFe_2B_2$* "
- 08/20/2012, American Chemical Society National Meeting and Exposition, Philadelphia, PA
Poster Presentation: Tan, X., Chai, P., & Shatruk, M. "*Magnetic ordering and magnetocaloric effect in $AlFe_2B_2$* "

Teaching Experience

Assistant Professor (George Mason University), CHEM 212 – General Chemistry II, Fall 2018; CHEM 336 – Physical Chemistry Lab I, Fall 2018

Awards

- 2017 – American Chemical Society, Division of Inorganic Chemistry Young Investigator Award
- 2015 – Florida State University (FSU) Graduate Student Research & Creativity Award
- 2015 – FSU Graduate Inorganic Chemistry Award
- 2015 – FSU Dissertation Research Grant
- 2015, 2014 – ORNL Go Award: Performing experiments at Oak Ridge National Laboratory
- 2014 – FSU Ermine M. Owenby, Jr. Travel Award (Granted to distinguished women researcher)
- 2014, 2013, 2012 – COGS: FSU Congress of Graduate Studies Conference Presentation Grant

Workshops (Participant)

- 2018 – New Faculty Workshop in Washington, D.C. August 2-4, 2018
- 2015 – Diffraction Workshop: Modern Methods in Rietveld Refinement for Structural Analysis
- 2014 – Neutron for Powder Diffraction Workshop at Oak Ridge National Laboratory (ORNL)
- 2014 – Magnetic Structure Determination from Neutron Diffraction Data Workshop at ORNL
- 2013– 10th LANSCE Neutron Scattering School at Los Alamos National Laboratory
- 2013– 15th Neutron and X-ray Scattering School at Argonne and Oak Ridge National Laboratory
- 2013 –Duquesne University and PANalytical X-ray Powder Diffraction Symposium and Workshop