

E. Andrew Payzant

Senior R&D Staff
Chemical Functionality Group
Center for Nanophase Materials Sciences
Oak Ridge National Laboratory
(865) 235-4981
payzanta@ornl.gov



Education

Dalhousie University, Halifax, Canada	Physics	B.S., 1984
Tech University of Nova Scotia, Halifax, Canada	Engineering Physics	B.Eng., 1987
Tech University of Nova Scotia, Halifax, Canada	Engineering Physics	M.Sc., 1989
University of Western Ontario, Canada	Materials Engineering	Ph.D., 1995

Professional Experience

2006–p Senior R&D Staff Member, Chemical Functionality Group, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory (ORNL)

2012–p Senior R&D Staff Member, Chemical and Engineering Materials Division, ORNL

2002–2012 Senior R&D Staff Member, Materials Science and Technology Division, ORNL

1997–2002 R&D Staff Member, Metals & Ceramics Division, ORNL

1995–1997 ORNL Postdoctoral Research Associate, Metals & Ceramics Division, ORNL

1992–1994 Engineer, Electrofuel Manufacturing Co., Ltd., Toronto, Canada

1989–1991 Research Assistant, Tech University of Nova Scotia, Halifax, Canada

Professional Affiliations

2010–p Associate Editor, *Journal of Nanomaterials*

2010–2012 Editorial Committee Chair, *Advanced Materials and Processes*

2007–p Member, LANSCE Materials Program Advisory Committee

2006–p Editorial Committee, *Advanced Materials and Processes*

2006–p Chair, Intl. Center for Diffraction Data (ICDD) Non-Ambient Diffraction Subcommittee

2001–p Member, American Association for the Advancement of Science, Materials Research Society, Neutron Scattering Society of America

2001–2002 Chairman, Oak Ridge Chapter of ASM International

1999–p Member, ICDD

1993–p Member, ASM International

Honors and Awards

2006 ICDD Fellow

1993 Ontario Graduate Scholar

1991 NSERC Postgraduate Scholar

Patents and Patent Applications

“Method for Synthesizing Zeolite Membranes,” J. Dong, M. Z. Hu, and E. A. Payzant, U.S. Patent Applic. No. 2003/0228969A1.

“Low Temperature Proton Conducting Oxide,” T. R. Armstrong, E. A. Payzant, S. A. Speakman, and M. Greenblatt, U.S. Patent #7,413,687, December 28, 2006.

“Solid Oxide Fuel Cell Cathode Material,” T. R. Armstrong, S. A. Speakman, and E. A. Payzant, U. S. Applic. No. 2007/0207373.

Publications (*More than 120 reviewed publications and one book chapter*) Full list follows CV

Research Interests

Neutron and X-ray diffraction techniques, characterization of residual stress, solid-state crystallization and phase transformations, crystal structure, preferred orientation, microstructure, mechanical, and electronic properties of materials, ion-transport materials (particularly related to solid oxide fuel cell and gas separations applications), bulk metallic glasses, photovoltaics, and nanomaterials.

Collaborations Outside ORNL During Past Five Years: T. J. Anderson (Univ. of Florida); J. H. Dong (Univ. of Cincinnati); J. H. Edgar (Kansas State Univ.); K. T. Hartwig (Texas A&M Univ.); P. K. Liaw (Univ. of TN-Knoxville); Y. H. (Ed) Ma (Worcester Polytechnical Institute); S. A. Speakman (MIT); C. Wang (Univ. of Maryland); D. Way (Colorado School of Mines); A. P. Wilkinson (Georgia Tech).

Graduate and Postdoctoral Advisors:

Graduate Advisor: Hubert W. King, University of Western Ontario, Canada

Postdoctoral Advisor: Camden R. Hubbard, Oak Ridge National Laboratory

Thesis Advisor and Postdoctoral-Scholar Sponsor:

Postdoctoral-Scholars: Melanie J. Kirkham (ORNL, 2010–p)

Scott A. Speakman (MIT Center for Materials Science and Engineering, previously with ORNL, 2002–2005)

PUBLICATIONS

E. Andrew Payzant

Center for Nanophase Materials Sciences Division
Oak Ridge National Laboratory
Oak Ridge, TN 37831
payzanta@ornl.gov

Book Chapters:

E. A. Payzant, "Other Topics," Chapter 9 in *Principles and Applications of Powder Diffraction*, eds. A. Clearfield, J. Reibenspies, N. Bhuvanesh, Wiley-VCH, Hoboken, NJ (2008).

Refereed Journals:

- S. Somarajan, M. A. Harrison, D. S. Koktysh, W. He, R. L. Stillwell, B. Harl, B. Schmidt, B. R. Rogers, E. A. Payzant, J. H. Dickerson, "Structural and Magnetic Analysis of Nanocrystalline Lead Europium Sulfide ($\text{Pb}_x\text{Eu}_y\text{S}$)," *accepted Materials Chemistry and Physics*.
- R. D. Schmidt, E. D. Case, J. E. Ni, J. S. Sakamoto, R. M. Trejo, E. Lara-Curzio, E. A. Payzant, M. J. Kirkham, R. A. Peascoe-Meisner, "The Temperature Dependent Coefficient of Thermal Expansion for p-Type $\text{Ce}_{0.9}\text{Fe}_{3.5}\text{Co}_{0.5}\text{Sb}_{12}$ and n-Type $\text{Co}_{0.95}\text{Pd}_{0.05}\text{Te}_{0.05}\text{Sb}_3$ Skutterudite Thermoelectric Materials," *Philosophical Magazine*, **92**, 1261-1286 (2012).
- Z.-A. Qiao, S. S. Brown, J. Adcock, G. M. Veith, J. C. Bauer, E. A. Payzant, R. R. Unocic, S. Dai, "A Topotactic Synthetic Methodology for Highly Fluorine-Doped Mesoporous Metal Oxides," *Angewandte Chemie International Edition* **51**, 2888-2893 (2012).
- Z. Sun, K. Xiao, J. K. Keum, X. Yu, K. Hong, J. Browning, I. N. Ivanov, J. Chen, J. Alongo, D. Li, B. G. Sumpter, E. A. Payzant, C. M. Rouleau, D. B. Geohegan, "PS-*b*-P3HT Copolymers as P3HT/PCBM Interfacial Compatibilizers for High Efficiency Photovoltaics," *Advanced Materials* **23**, 5529-5535 (2011).
- C.-N. Sun, M. C. Gupta, E. A. Payzant, "Effect of Laser-Sintering on Ti-ZrB₂ Mixtures," *Journal of American Ceramic Society* **94**(10), 3282-3285 (2011).
- W. Chen, C. J. Boehlert, J. Y. Howe, E. A. Payzant, "Elevated-Temperature Mechanical Behavior of As-Cast and Wrought Ti-6Al-4V-1B Alloys," *Metallurgical and Materials Transactions A* **42**(10), 3046-3061 (2011).
- N. Kumar, E. A. Payzant, K. Jothimurugesan, J. J. Spivey, "Combined In Situ XRD and In Situ XANES Studies on the Reduction Behavior of a Rhenium Promoted Cobalt Catalyst," *Physical Chemistry Chemical Physics* **13**, 14735-14741 (2011).
- M. J. Kirkham, P. Majsztrik, E. Skoug, D. Morelli, H. Wang, W. D. Porter, E. A. Payzant, E. Lara-Curzio, "High-Temperature Order/Disorder Transition in the Thermoelectric Cu_3SbSe_3 ," *Journal of Materials Research* **26**, 2001-2005 (2011).
- J. Nag, E. A. Payzant, K. L. More, R. F. Haglund, Jr., "Enhanced Performance of Room-Temperature-Grown Epitaxial Thin Films of Vanadium Dioxide," *Applied Physics Letters* **98**, 251916 (2011).
- C. A. Bridges, A. S. Sefat, E. A. Payzant, L. D. Cranswick, M. P. Paranthaman, "Structure and Magnetic Order in the Series $\text{Bi}_x\text{RE}_{1-x}\text{Fe}_{0.5}\text{Mn}_{0.5}\text{O}_3$ (RE = La, Nd)," *Journal of Solid State Chemistry* **184**, 830-842 (2011).
- C. M. McGilvery, D. W. McComb, S. De Gendt, E. A. Payzant, M. MacKenzie, A. J. Craven, "Characterization of Hafnia Powder Prepared from an Oxychloride Sol-Gel," *Journal of American Ceramic Society* **94**, 886-894 (2011).
- M. A. McLachlan, D. W. McComb, M. P. Ryan, A. N. Morozovska, E. Eliseev, E. A. Payzant, N. S. Jesse, K. Seal, S. V. Kalinin, "Probing Local and Global Ferroelectric Phase Stability and

- Polarization Switching in Ordered Macroporous PZT,” *Advanced Functional Materials* **21**, 941-947 (2011).
- J. C. Bauer, D. Mullins, M. J. Lie, Z. Wu, E. A. Payzant, S. H. Overbury, S. Dai, “Synthesis of Silica-Supported Intermetallic AuCu Nanoparticle Catalyst for CO Oxidation,” *Physical Chemistry Chemical Physics* **13**, 2571-2581 (2011).
- T. J. Toops, N. A. Ottinger, C. Liang, J. A. Pihl, E. A. Payzant, “Impact of Dopants on the Sulfation, Desulfation and NO_x Reduction Performance of Ba-Based NO_x Storage Reduction Catalysts,” *Catalysis Today* **160**, 131-136 (2011).
- C. Mossaad, M. Starr, E. A. Payzant, J. Y. Howe, R. E. Riman, “Size-Dependent Crystalline to Amorphous Uphill Phase Transformation of Hydroxyapatite Nanoparticles,” *Crystal Growth and Design* **11**, 45-52 (2011).
- C. Ban, Z. Li, Z. Wu, M. J. Kirkham, L. Chen, Y. S. Jung, E. A. Payzant, Y. Yan, M. S. Whittingham, A. C. Dillon, “Extremely Durable High-Rate Capability of the LiNi_{0.4}Mn_{0.04}Co_{0.2}O₂ Cathode Enabled with Single-Wall Carbon Nanotubes,” *Advanced Energy Materials* **1**, 58-62 (2011).
- V. G. Varanasi, T. M. Besmann, A. Payzant, B. A. Pint, J. L. Lothian, T. J. Anderson, “High-Growth Rate YSZ Thermal Barrier Coatings Deposited by MOCVD Demonstrate High Thermal Cycling Lifetime,” *Materials Science and Engineering A* **528**, 978-985 (2011).
- S. G. Sorenson, E. A. Payzant, W. T. Gibbons, B. Soydas, H. Kita, R. D. Noble, J. L. Falconer, “Influence of NaA Zeolite Crystal Expansion/Contraction on Zeolite Membrane Separations,” *Journal of Membrane Sciences* **366**, 413-420 (2011).
- N. Pomerantz, E. A. Payzant, Y. H. Ma, “Isothermal Solid-State Transformation Kinetics Applied to Pd/Cu Alloy Membrane Fabrication,” *AIChE Journal* **56**, 3062-3073 (2010).
- J. B. Fox, P. J. Ambuken, H. A. Stretz, R. A. Peascoe, E. A. Payzant, “Organo-Montmorillonite Barrier Layers Formed by Combustion: Nanostructure and Permeability,” *Applied Clay Science* **49**, 213-223 (2010).
- S. G. Sorenson, E. A. Payzant, R. D. Noble, J. L. Falconer, “Influence of Crystal Expansion/Contraction on Zeolite Membrane Permeation,” *Journal of Membrane Sciences* **357**, 98-104 (2010).
- S. Pathak, J. Kuebler, E. A. Payzant, N. Orlovskaya, “Mechanical Behavior and Electrical Conductivity of La_{1-x}Ca_xCoO₃ (x = 0, 0.2, 0.4, 0.55) Perovskites,” *Journal of Power Sources* **195**, 3612-3620 (2010).
- W. Chen, C. J. Boehlert, E. A. Payzant, J. Y. Howe, “The Effect of Processing on the 455°C Tensile and Fatigue Behavior of Boron-Modified Ti-6Al-4V,” *International Journal of Fatigue* **32**, 627-638 (2010).
- K. Xiao, R. Li, J. Tao, E. A. Payzant, I. N. Ivanov, A. A. Puzetzy, W. Hu, D. B. Geohegan, “Metastable Copper-Phthalocyanine Single-Crystal Nanowires and Their Use in Fabricating High-Performance Field-Effect Transistors,” *Advanced Functional Materials* **19**, 3776-3780 (2009).
- S. K. Gade, E. A. Payzant, H. J. Park, P. M. Thoen, J. D. Way, “The Effects of Fabrication and Annealing on the Structure and Hydrogen Permeation of Pd-Au Binary Alloy Membranes,” *Journal of Membrane Sciences* **340**, 227-233 (2009).
- S. Pathak, D. Steinmetz, J. Kuebler, E.A. Payzant, N. Orlovskaya, “Mechanical Behavior of La_{0.8}Sr_{0.2}Ga_{0.8}Mg_{0.2}O₃ Perovskites,” *Ceramics International* **35**, 1235-1241 (2009).
- V. G. Varanasi, T. M. Besmann, R. L. Hyde, E. A. Payzant, T. J. Anderson, “MOCVD of YSZ Coatings Using β-diketonate precursors,” *Journal of Alloys & Compounds* **470**, 354-359 (2009).
- L. Yang, X.-L. Wang, W. D. Porter, Z. P. Lu, A. D. Stoica, E. A. Payzant, D. Shi, “Consecutive Nucleation Events During Devitrification of Zr_{52.5}Cu_{17.9}Ni_{14.6}Al₁₀Ti₅ Bulk Metallic Glass,” *Advanced Engineering Materials* **10**, 1043-1047 (2008).
- X. Chen, C. Wang, E.A. Payzant, C. Xia, D. Chu, “An Oxide Ion and Proton Co-Ion Conducting Sn_{0.9}In_{0.1}P₂O₇ Electrolyte for Intermediate-Temperature Fuel Cells,” *Journal of Electrochemical Society* **155**, B1264-B1269 (2008).
- M. A. McGuire, A. D. Christianson, A. S. Sefat, B. C. Sales, M. D. Lumsden, R. Jin, E. A. Payzant, D. Mandrus, Y. Luan, V. Keppens, V. Varadarajan, J. W. Brill, R. P. Hermann, M. T. Sougati, F.

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- A. C. Rizzie, T. R. Watkins, E. A. Payzant, "Elaboration on the Hexagonal Grid and Spiral Trace Schemes for Pole Figure Data Collection," *Powder Diffraction* **23**, 87-91 (2008).
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- W. K. Kim, E. A. Payzant, S. Kim, S. A. Speakman, T. J. Anderson, "Reaction Kinetics of CuGaSe₂ Formation from a GaSe/CuSe Bilayer Precursor Film," *Journal of Crystal Growth* **310**, 2987-2994 (2008).
- V. G. Varanasi, T. M. Besmann, E. A. Payzant, T. L. Starr, T. J. Anderson, "Thermodynamic Analysis and Experimental Growth of ZrO₂ by Chloride CVD," *Thin Solid Films* **516**, 6133-6139 (2008).
- S. Mahajan, J. Hart, J. Hood, A. Everheart, M. L. Redigelo, D. S. Kotysh, E. A. Payzant, J. H. Dickerson, "Synthesis of RE(OH)₂Cl and REOCl (RE+Eu,Tb) Nanostructures," *Journal of Rare Earths* **26**, 131-135 (2008).
- M. E. Ayturk, E. A. Payzant, S. A. Speakman, Y. H. Ma, "Isothermal Nucleation and Growth Kinetics of Pd/Ag Alloy Phase via *In Situ* Time Resolved High Temperature X-ray Diffraction (HTXRD) Analysis," *Journal of Membrane Sciences* **316**, 96-111 (2008).
- A. D. Christianson, M. D. Lumsden, M. Angst, Z. Yamani, W. Tian, R. Jin, E. A. Payzant, S. E. Nagler, B. C. Sales, D. Mandrus, "Three-Dimensional Magnetic Correlations in Multiferroic LuFe₂O₄," *Physical Review Letters* **100**, 107601 (2008).
- B. Yang, M. P. Brady, H. Wang, J. A. Turner, K. L. More, D. J. Young, P. F. Tortorelli, E. A. Payzant, L.R. Walker, "Growth of Protective Cr-Nitride Surfaces for Stainless Steel Bipolar Plates," *Journal of Power Sources* **174**, 228-236 (2007).
- L. Wu, G. M. Stoica, H. H. Liao, S. R. Agnew, E. A. Payzant, G. Wang, D. Fielden, L. Chen, P. K. Liaw, "Fatigue-Property Enhancement of Magnesium Alloy AZ31B Through Equal-Channel Angular Pressing (ECAP)," *Metallurgical and Materials Transactions A* **38**, 2283-2289 (2007).
- W. K. Kim, E. A. Payzant, T. J. Anderson, "In-Situ Investigation of the Selenization Kinetics of Cu-Ga Precursors Using Time-Resolved High-Temperature X-Ray Diffraction," *Thin Solid Films* **515**, 5837-5842 (2007).
- Y. Yamamoto, M. P. Brady, Z. P. Lu, P. J. Maziasz, C. T. Liu, B. A. Pint, K. L. More, H. A. Meyer, E. A. Payzant, "Creep-Resistant Al₂O₃-Forming Austenitic Stainless Steels," *Science* **316**, 433-436 (2007).
- F. Guazzone, E. A. Payzant, S. A. Speakman, Y. H. Ma, "Microstrains and Stresses Analysis in Electroless Deposited Thin Pd Films," *Industrial Engineering Chemistry Research* **45**, 8145-8153 (2006).
- W. K. Kim, E. A. Payzant, S. Yoon, T. J. Anderson, "In-Situ Investigation on Selenization Kinetics of Cu-In Precursor Using Time-Resolved High Temperature X-Ray Diffraction," *Journal of Crystal Growth* **294**, 231-235 (2006).
- G. M. Stoica, E. A. Payzant, L. Wu, H. H. Liao, J. E. Spruiell, P. K. Liaw, "Development of the Microstructure of Severely Plastically Deformed Mg Alloy, ZK60," *Advances in X-Ray Analysis* **39**, 116-121 (2006).

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- X. Wang, B. I. Lee, M. Z.-C. Hu, E. A. Payzant, D. A. Blom, "Nanocrystalline BaTiO₃ Powder via Ambient Conditions Sol Process," *Journal of the European Ceramic Society* **26**, 2319-2326 (2006).
- Z. Gu, L. Du, J. H. Edgar, E. A. Payzant, L. R. Walker, R. Liu, M. H. Engelhard, "Aluminum Nitride – Silicon Carbide Alloy Crystals Grown on SiC Substrates by Sublimation," *MRS Internet Journal Nitride Semiconductor Research* **10(5)**, 5 (2005).
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- M. P. Brady, P. F. Tortorelli, K. L. More, E. A. Payzant, B. L. Armstrong, H. T. Lin, M. J. Lance, F. Huang, M. L. Weaver, "Coating and Near-Surface Modification Design Strategies for Protective and Functional Surfaces," *Materials and Corrosion* **56**, 748-755 (2005).
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- S. Sathyamurthy, M. Paranthaman, M. S. Bhuiyan, E. A. Payzant, D. F. Lee, A. Goyal, X. Li, T. Kodenkandath, U. Schoop, M. Rupich, "Solution Deposition Approach to High J_c Coated Conductor Fabrication," *IEEE Transactions on Applied Superconductivity* **15**, 2974-2976 (2005).
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