



Dr. Jason Babcock is highly experienced in scientific and chemistry consulting, specializing in the application of science, technology and laboratory testing to solve unique problems and perform forensic analysis. He has a Doctorate in Inorganic Chemistry, and a M.S. and B.A. in Chemistry.

### Profile

- **Chemist:** Broad General Chemistry knowledge that is invaluable to understanding the interaction of materials on a molecular level. Extensive experience designing and building experimental apparatus and performing analytical testing of a wide variety of materials, interpreting the results, and providing detailed reports summarizing the findings.
- **Laboratory Expertise:** Provides practical and comprehensive testing that is independent and unbiased. Access to analytical chemistry instrumentation, ASTM qualified test machines, optical microscopes, SEM, FTIR, load cells, sensors, accelerometers, electro-chemical corrosion test hardware, and other instrumentation.
- **Failure Analyst:** Brings a strong experience in applying modern materials science coupled with a focus on failure analysis and the use of standardized testing techniques. Evaluates the effects of corrosion, temperature, and mechanical stresses on the performance of materials.
- **Material Scientist:** Practical experience performing a broad range of tests to determine the strength, physical, chemical, and wear properties of metals, ceramics, composites, and plastics. Investigates the compliance of materials to meet a product design criteria and margin of safety.
- **Project Manager:** Confident public speaking skills with experience in grant writing, proposal preparation, and management of government funded research programs interfacing with small and large companies, research institutions, and government entities.

### Expertise

Chemical Analysis	Laboratory Safety	Mechanical Testing
Construction Materials	Unknown Identification	Metallographic Analysis
Experimental Design	Composite Structures	Fracture Analysis
Technical Litigation	Thin Films	Metal Fatigue
Material Compatibility	Refractory Materials	Wear Testing
Patent Infringement	Catalysis	Tribology
Alternative Energy	Ceramics	Corrosion
Biofuels	Plastics & Polymers	Photography
Toxicity	Air-Sensitive Materials	Microscopy

### **Consumer Products**

- Investigated the cause and origin of symptoms related to problem Chinese drywall. Designed and carried out experiments that demonstrated whether or not samples of drywall possess these problematic characteristics. Developed a minimally invasive field portable test to identify problem drywall using a ¼" core sample.
- Invented new fire retardant formulation for construction related product currently moving toward plant trials with targeted company-wide implementation.
- Led investigations to scientifically quantify and document numerous types of consumer product contamination cases involving insurance disputes in preparation for potential litigation.
- Led a multidisciplinary investigation into the contamination of warehouse inventory exposed to a natural gas leak.
- Assisted client with confirmation of chemical incompatibility between product and packaging that led to significant product loss.
- Investigated and made recommendations for clients living in a rural home exhibiting toxic house syndrome.

### **Analytical Testing and Research**

- Carried out proof pressure and helium leak testing of stainless steel filters that are currently in use on the International Space Station.
- Performed testing of limestone starting material and gypsum product from large scale flue gas desulfurization system recently installed in coal-fired power plant. Assisted client in root cause determination of problems encountered in the system due to impurities found in starting material.
- Carried out ASTM standardized testing to determine the concentration of hydrocarbons in polystyrene beads via gas chromatography.
- Developed and characterized method for the preparation of nanoporous silicon structures to be used for solid phase storage of hydrogen in alternative energy applications.
- Co-invented system being developed and trialed to demonstrate the ability to produce oxygen from simulated lunar soil with support of a lunar base the ultimate goal.
- Investigated the gasification of various feedstocks, including biomass, municipal solid waste, and discarded consumer products, as a means for alternative energy generation.
- Expert in the use and implementation of the following analytical techniques: SEM/EDS, FTIR, Auger Electron and X-ray Photoelectron Spectroscopy, NMR, GC, GC/MS, HPLC, AA, ICP, XRD, DSC, TGA, various mechanical testing and evaluation of thermal properties

## Education Degrees and Certificates

- Ph.D. - University of Chicago, Chicago, IL – Inorganic Chemistry (1998)
- M.S. - University of Chicago, Chicago, IL – Inorganic Chemistry (1995)
- B.A. - Illinois Wesleyan University, Bloomington, IL – Chemistry (1994)
- Postdoctoral- Northwestern University, Evanston, IL – Materials Science (1998-2000)

### Academic Honors

- Alumni Academic Scholarship (1990-1994)
- Outstanding Undergraduate Research Award (1994)

### Professional Affiliations

- American Chemical Society
- American Ceramic Society

## Employment

### 2011 to Present

#### **Director of Science & Technology**, ITC Experts, Sugar Grove, IL

ITC is an engineering consulting firm and advanced Research and Development organization providing technical solutions to the military, industry, litigation, and insurance fields. Dr. Babcock consults on all aspects of scientific, mechanical, and material related problems. He is also responsible for engineering activities involving product performance, failure analysis, and fire cause and origin analysis. Areas of specific failure analysis expertise include: building and construction materials, automotive and transportation equipment, pressure vessels and piping, various forms of corrosion, and consumer products.

### 2006 to Present

#### **Chief Scientist**, Green Light Industries LLC, West Chicago, IL

Green Light Industries is a high tech start-up company developing alternative energy and aerospace propulsion concepts using principles of advanced materials science, physics, and chemistry. Dr. Babcock co-invented and developed a business plan with company founder for efficient environmentally friendly electric power generation via chemical reactions. He also designed and built a chemical vapor deposition (CVD) reactor for metal and ceramic coating capability.

2008-2011

**Senior Consultant**, Packer Engineering Inc, Naperville, IL

Packer Engineering is a nationally recognized forensics engineering firm. Dr. Babcock consulted on all aspects pertaining to chemical analysis and custom experimental design and execution. He functioned as disclosed expert in litigation cases and insurance disputes. He also conducted research as part of government sponsored programs on advanced composite materials, hydrogen storage, biomass conversion to electricity, and oxygen generation in the lunar environment.

2007

**Adjunct Faculty**, Waubensee Community College, Sugar Grove, IL  
Taught *General Chemistry*.

2000-2006

**Senior Research Scientist**, Ultramet Inc, Pacoima, CA

Ultramet engineers, develops, and manufactures refractory metals, platinum group metals, and ceramics for extreme environments and high performance. Dr. Babcock managed multiple government research programs sponsored by NASA, the DoD, the DoE, and the NSF as Principal Investigator. Grant funding procured by him exceeded \$3.5 million in the last three years at the company. These projects innovated unique materials solutions through design, development, processing, characterization, and testing of high temperature CVD coatings, composites, ceramics, and metals for aerospace applications.

## Technical Patents

- 1) "Hydrogen Extraction" Jackson, G. P., Babcock, J. R., and Zlotnicki, J. M.; United States Patent Application 20100035103, 2/11/10.
- 2) "Catalytic Smog Reduction" Jackson, G. P., Babcock, J. R., and Zlotnicki, J. M.; United States Patent Application 20100018191, 1/28/10.
- 3) "Self-Adjusting Propellant Decomposition Catalyst" Babcock, J. R., Fortini, A. J., and Wright M. J.; United States Patent Application 20080064913 11/20/05.
- 4) "Metal Gas Separation Membrane" Alvin, M.A., Babcock, J. R.; United States Patent 7018446 9/24/03.
- 5) "Decomposition of Organic Azides" Babcock, J. R. and Fortini, A. J. ; United States Patent 7338540 8/7/02.

Technical Selected Presentations and Papers

- 1) R.P. Hsung, J.R. Babcock et al., "Thiophenol Protecting Groups for the Palladium-Catalyzed Heck Reaction: Efficient Synthesis of Conjugated Arylthiols," *Tetrahedron Lett.* **36** (1995), 4525-4528.
- 2) R. Xi, J.R. Babcock, and L.R. Sita, "A Thermal Reductive-Elimination Route to Perbutylated Cyclopolystannanes," *Organometallics* **15** (1996), 2849-2851.
- 3) L.R. Sita, J.R. Babcock, and R. Xi, "Facile Metathetical Exchange between Carbon Dioxide and the Divalent Group 14 Bisamides  $M[N(SiMe_3)_2]_2$  ( $M = Ge$  and  $Sn$ )," *J. Am. Chem. Soc.* **118** (1996), 10912.
- 4) J.R. Babcock and L.R. Sita, "Highly Branched, High Molecular Weight Polystannane from Dibutylstannane via a Novel Dehydropolymerization/Rearrangement Process," *J. Am. Chem. Soc.* **118** (1996), 12481-12482.
- 5) J.R. Babcock and L.R. Sita, "Facile Preparation of Unsymmetric Carbodiimides via in situ Tin(II)-Mediated Heterocumulene Metathesis," *J. Am. Chem. Soc.* **120** (1998), 5585-5586.
- 6) J.R. Babcock, R.W. Zehner, and L.R. Sita, "A Heterocumulene Metathesis Route to  $Cd[ESiMe_3]_2$  and Passivated CdE ( $E = S$  and  $Se$ ) Nanocrystals," *Chem. Mater.* **10** (1998), 2027-2029.
- 7) L.R. Sita and J.R. Babcock, "Rapid Access to Dimethylcyclopentadienyltitanium(IV) Amidinate,  $(C_5R_5)TiMe_2[NR^1C(R^2)NR^3]$  ( $R = H$  and  $Me$ ;  $R^2 = Me$ ), Libraries," *Organometallics* **17** (1998), 5228-5230.
- 8) J.R. Babcock et al., "Syntheses, Structural Characterizations and Heterocumulene Metathesis Studies of New Monomeric Bis(trimethylsilylamido)tin(II) Derivatives," *Organometallics* **18** (1999), 4437-4441.
- 9) J.R. Babcock et al., "Double Heterocumulene Metathesis of Cyclic Bis(trimethylsilylamido)stannylenes and a New Route to Tethered Bimetallic Bisamidinates from the Resulting  $\alpha,\omega$ -Biscarbodiimides," *Organometallics* **18** (1999), 5729-5732.
- 10) J.A. Belot, A. Wang, N.L. Edleman, J.R. Babcock et al., "Metal-Organic Chemical Vapor Deposition Of Metal Oxides: From Precursor Synthesis To Thin Films," *Mater. Res. Soc. Symp.*, **574** (1999) 37-43.
- 11) Wang, A.; Edleman, N.L.; Babcock, J.R.; Marks, T.J.; Lane, M.A.; Brazis, P.; Kannewurf, C.R. Metal-Organic Chemical Vapor Deposition of In-Zn-Sn-O and In-Ga-Sn-O Transparent Conducting Oxide Thin Films, MRS Symposium Series, 2000, 607, 345-352.
- 12) J.R. Babcock et al., "Polydentate Amines As CVD Precursor Ancillary Ligands. Epitaxial MgO Thin Film Growth Using A Highly Volatile, Thermally- And Air-Stable Magnesium Precursor," *Adv. Mater. (Chem. Vap. Depos.)* **6** (2000), 180-183.
- 13) J.R. Babcock et al., "Transparent Conducting CdO Thin Film Growth Using a Highly Volatile, Thermally and Air-Stable Cadmium Precursor" *Adv. Mater. (Chem. Vap. Depos.)* **7** (2001), 239-242.
- 14) Wang, A.; Babcock, J.R.; Edleman, N.L.; Metz, A.W.; Lane, M.A.; Asahi, R.; Dravid, V.P.; Kannewurf, C.R.; Freeman, A.J.; Marks, T.J. "Indium-Cadmium-Oxide Films Having Exceptional Electrical Conductivity and Optical Transparency. Clues for Optimizing Transparent Conductors" *Proc. Nat. Acad. Sci.* **98** (2001) 7113-7116.
- 15) J.R. Babcock et al., "Plasma-Assisted MOCVD Growth of Superconducting NbN Thin Films Using Nb Dialkylamide and Nb Alkylimide Precursors," *Adv. Mater. (Chem. Vap. Depos.)* **7** (2001) 25-28.
- 16) N.L. Edleman, J.A. Belot, A. Wang, J.R. Babcock et al., "Volatile, Fluorine-Free Precursors for MOCVD of Lanthanide Oxide Thin Films," submitted to *Mater. Res. Soc. Symp.*
- 17) J.R. Babcock et al., "Development and Implementation of New Volatile Cd and Zn Precursors for the Growth of Transparent Conducting Oxide Thin Films via MOCVD," *Mater. Res. Soc. Symp.* **623** (2000) 317-28.

- 18) Yan, M.; Koide, Y.; Babcock, J. R. ; Markworth, P. R.; Belot, J. A.; Marks, T. J.; Chang, R. P. H., "Selective-area atomic layer epitaxy growth of ZnO features on soft lithography-patterned substrates" *Appl. Phys. Lett.* **79** (2001) 1709-11.
- 19) Asahi, R.; Babcock, J.R.; Dravid, V.P.; Edleman, N.L.; Freeman, A.J.; Kannewurf, C.R.; Lane, M.A.; Marks, T.J.; Metz, A.W.; Wang, A., "First-principles calculations for understanding high conductivity and optical transparency in  $\text{In}_x\text{Cd}_{1-x}\text{O}$  films," *Thin Solid Films* **411** (2002) 101-105.
- 20) Edleman, N.L.; Belot, J.A.; Metz, A.W.; Babcock, J.R.; Kawaoka, A.M.; Ni, J.; Metz, M.V.; Flischenriem, C.J.; Stern, C.L.; Liable-Sands, L.M.; Rheingold, A.L.; Markworth, P.R.; Chang, R.P.H.; Chudzik, M.P.; Kannewurf, C.R.; Marks, T.J., "Synthesis and Characterization of Volatile, Fluorine-Free  $\beta$ -Ketoiminate Lanthanide MOCVD Precursors and Their Implementation in Low Temperature Growth of Epitaxial  $\text{CeO}_2$  Buffer Layers for Superconducting Electronics," *Inorg. Chem.* **41** (2002) 5005-5023.
- 21) Asahi, R.; Babcock, J.R.; Edleman, N.L.; Kammler, D.R.; Ko, D.; Lane, M.A.; Metz, A.W.; Wang, A.; Yan, M.; Chang, R.P.H.; Dravid, V.; Freeman, A.J.; Kannewurf, C.R.; Marks, T.J.; Mason, T.O.; Poeppelmeier, K.R. New Transparent Conducting Oxides. Progress in Understanding Cadmium-Containing Bulk and Thin-Film Materials, in Kapur, V.K.; McConnell, R.D.; Carlson, D.; Caesar, G.P.; Rohatgi, A.; Smith, J., Eds. "Photovoltaics for the 21<sup>st</sup> Century," Electrochemical Society, Washington, D.C., 2001, pp. 333-348.
- 22) Babcock, Jason R.; Brazis, Paul R.; Edleman, Nikki L.; Kannewurf, Carl R.; Lane, Melissa A.; Marks, Tobin J.; Wang, Anchuan; "Growth, Microstructure, Charge Transport, And Transparency Of Random Polycrystalline And Heteroepitaxial Metalorganic Chemical Vapor Deposition-Derived Gallium-Indium-Oxide Thin Films" *J Mater Res.* **17** (2002) 3155-3162.
- 23) J.R. Babcock and A.J. Fortini, "Catalysts and Catalyst Substrates for Advanced Monopropellants," Final Report (ULTRA-TR-01-3223), Contract F04611-00-C-0042, Ultramet for Air Force Research Laboratory, Propulsion Directorate, Edwards AFB, CA, February 2001.
- 24) J.R. Babcock, "Nanostructured Thermal Barrier Coatings for Turbine Engines," Final Report (ULTRA-TR-01-3348), Contract DAAH10-01-C-0013, Ultramet for U.S. Army Aviation and Missile Command, Aviation Applied Technology Directorate, Fort Eustis, VA, January-June 2001.
- 25) Babcock, J.R, Williams, B.E., and Brockmeyer, J.W. "Oxide Interfaces For Carbon Fiber Reinforced Ceramic Matrix Composites," presented at the ACerS 26<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 28-31, 2002.
- 26) Jason R. Babcock, Brian E. Williams, and Jerry W. Brockmeyer, Diep Trinh, "Oxide Interfaces For Carbon-Fiber Reinforced Ceramic Matrix Composites," presented at the ACerS 26<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 28-31, 2002.
- 27) Fortini, A. J. and Babcock, J. R. "Low Temperature Catalysis of Organic Azides," presented at the JANNAF 30<sup>th</sup> Propellant Development & Characterization Meeting, Colorado Springs, CO, 3/18/02.
- 28) Brian E. Williams, Jerry W. Brockmeyer, and Jason R. Babcock, "Melt Infiltrated Ceramic Matrix Composites For Ultrahigh Temperature Applications" presented at the National Space and Missile Materials Symposium, Houston, TX, 6/02.
- 29) A.J. Fortini and J.R. Babcock, "Advanced Monopropellant Catalysts," Final Report (ULTRA-TR-02-3365), Contract DAAH01-01-C-R097, Ultramet for U.S. Army Aviation and Missile Command, Propulsion and Structures Directorate, Redstone Arsenal, AL, February-December 2001.
- 30) J.R. Babcock and B.E. Williams, "Economical Fabrication of Thick-Section Ceramic Matrix Composites," Final Report (ULTRA-TR-02-3503), Contract NAS8-01142, Ultramet for NASA Marshall Space Flight Center, Huntsville, AL, November 2001-May 2002.
- 31) J.R. Babcock, G. Ramachandran, B.E. Williams, J.W. Brockmeyer, "Carbon Fiber-Reinforced, Melt-Infiltrated Ceramic Matrix Composites For Ultrahigh Temperature Applications," presented at

- the ACerS 27<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 30, 2003.
- 32) J.R. Babcock, G. Ramachandran, B.E. Williams, J.W. Brockmeyer, "Fabrication of Thick-Section Melt Infiltrated Ceramic Matrix Composites," presented at the National Space and Missile Materials Symposium, San Diego, CA, June 26, 2003.
  - 33) J.R. Babcock and B.E. Williams, "Fabrication of Ceramic Matrix Composite Blisks from Near-Net Shape Preforms," Final Report (ULTRA-TR-03-3750), Contract DAAH10-03-C-0033, Ultramet for Army/Aviation & Missile Command, Ft. Eustis, VA, January 2003-July 2003.
  - 34) J.R. Babcock and B.E. Williams, "Multilayer Fiber Interfaces for Improved Environmental and Slip in Carbon-Fiber CMCs," Final Report (ULTRA-TR-03-3762), Contract NAS8-03010, Ultramet for NASA Marshall Space Flight Center, Huntsville, AL, January 2003-July 2003.
  - 35) J.R. Babcock, "Cubic Phase-Stabilized Zirconia Thermal Barrier Coatings Applied via a Novel CVD Route," Final Report (ULTRA-TR-03-3749), Contract DMI-0231685, Ultramet for the National Science Foundation, Arlington, VA, January 2003-July 2003.
  - 36) J. R. Babcock, R. Benander, A. Fortini, A. Duffy, "Chemical Vapor Deposition Of Cubic Phase Yttria-Stabilized Zirconia Thermal Barrier Coatings," 55th Pacific Coast Regional & Basic Science Division Fall American Ceramic Society Meeting, Oakland, CA, 10/20/03.
  - 37) J. R. Babcock, B. E. Williams, G. Ramchandran, and M. R. Effinger, "Recent Advances In The Development Of Thick-Section Melt-Infiltrated C/SiC Composites," presented at the ACerS 28<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 26, 2004.
  - 38) J. R. Babcock, B. E. Williams, G. Ramchandran, and M. R. Effinger, "Multilayer Fiber Interfaces For Improved Environmental Resistance And Slip In Carbon Fiber Reinforced Composites," presented at the ACerS 28<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 27, 2004.
  - 39) Sharafat, S.; Ghoniem, N.; Babcock, J. R.; Williams, B. E., "Cellular Foams: A Potential Innovative Solid Breeder Material for Fusion Applications," *Fusion Energy – Fusion Materials* **2005**, *47*, 886-889.
  - 40) J. R. Babcock, B. E. Williams, G. Ramchandran, and M. R. Effinger, "Multilayer Fiber Interfaces For Improved Environmental Resistance And Slip In Carbon Fiber Reinforced Composites," presented at the ACerS 29<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 25, 2005.
  - 41) J. R. Babcock, B. E. Williams, G. Ramchandran, and M. R. Effinger, "Fabrication Of Thick-Section Melt-Infiltrated C/SiC Composites," presented at the ACerS 29<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 25, 2005.
  - 42) J. R. Babcock, G. Ramchandran, T. R. Stewart, and B. E. Williams, "Fabrication Of Thick-Section Melt-Infiltrated C/SiC Composites," presented at the ACerS 30<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 24, 2006.
  - 43) J. R. Babcock, A. T. Allen, B. E. Williams, D. V. Trinh and M. R. Effinger, "Multilayer Fiber Interfaces For Improved Environmental Resistance And Slip In Carbon Fiber Reinforced Composites," presented at the ACerS 30<sup>th</sup> Conference on Composites, Materials and Structures, Cocoa Beach/Cape Canaveral, FL, January 25, 2006.