Martin Bettge
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Argonne National Laboratory - Chemical Sciences and Engineering Div. - Electrochemical Energy Storage Dept.
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EDUCATION

Doctor of Philosophy — **University of Illinois at Urbana-Champaign, IL**
Mechanical Science & Engineering, Focus on Energy Materials — Aug. 2005 – May 2011

Dissertation: **Growth and Applicability of Radiation-Responsive Silica Nanowires**
Min-Feng Yu (chair), Ivan Petrov, John A. Rogers, Placid M. Ferreira, Daniel Abraham

Master of Science — **Florida State University - Tallahassee, FL**
Mechanical Engineering, Focus on Materials Science — Aug. 2002 – Aug. 2004

Thesis: ***Processing of Porous Electrodes for Solid Oxide Fuel Cells Using Tape Casting and Unidirectional Freeze-Drying,*** *Peter J. Gielisse (chair), Peter N. Kalu, Juan C. Ordonez*

Bachelor of Science — **University of Applied Sciences Aachen, Germany** — Sept. 1998 – Sept. 2002
Major: Applied Physics

EXPERIENCE

Postdoctoral Research Associate — **Argonne National Laboratory - Argonne, IL** — May 2011 – Present
- Diagnostics & post-mortem analysis on high energy lithium-ion cells for advanced electric drivetrains
- Identification & mitigation of degradation mechanisms on cell-level and atomic-scale to improve performance and life time of these cells

Graduate Research Assistant — **University of Illinois at Urbana-Champaign, IL** — Jan. 2005 – May 2011
- Fabrication & characterization of highly textured pos. and neg. battery thin film electrodes
- Development and optimization of a novel ion-assisted PVD process for growth of nanostructured thin films and nanowires
- Invention of a novel cost-reducing and light-trapping Si-based solar cell

R&D Engineer — **Argonne National Laboratory - Argonne, IL** — Jun. 2004 – Nov. 2004
- Design & evaluation of high temperature test stand for Solid Oxide Fuel Cells (SOFCs)
- Conducted high-temperature electrochemical impedance measurements

Grad. Research Assistant — **Florida State University - Tallahassee, FL** — Nov. 2001 – Jun. 2004
- Synthesis and microanalysis of CNTs and carbon-based nanostructures
- Fabrication of graded porous electrodes for SOFCs via directional ceramic freeze-drying
- Synthesis of nanomaterials for magnetic and thermally-controlled drug delivery systems

Grad. Teaching Assistant — **Florida State University - Tallahassee, FL** — Aug. 2002 – Jun. 2004
- Supervision of an award-winning SOFC senior design team
- Lecturing engineering courses and labs for classes with up to 30 students

Undergrad. Research Assistant — **Vika Ingenieure GmbH - Aachen, Germany** — Oct. 2000 – Oct. 2001
- Analysis of engineering work and knowledge flow within a small energy consulting firm
- Design of a database management system

TECHNICAL EXPERTISE and LANGUAGES

- **Key experience in diagnostics/prognostics of electrochemical energy storage systems, synthesis and analysis of inorganic bulk and nanostructured materials**
- Specific knowledge of microfabrication, powder processing, tape casting, chemical & physical vapor deposition, vacuum technology, electrochemistry
- Experienced with various micro- and surface analysis techniques: TEM, SEM, AFM, XRD, XPS, Auger, RBS, SIMS, Raman, ellipsometry, UV-VIS-IR spectrophotometry
- Electrochemical impedance spectroscopy, cyclic voltammetry
- Multilingual, fluent in German and English, elementary knowledge of French, Spanish and Latin
- Technical and scientific communication skills:
  15 peer-reviewed publications, 3 manuscripts under internal review, 10+ scientific presentations

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PUBLICATIONS, PATENTS, & PRESENTATIONS

PEER-REVIEWED JOURNALS

- ***Voltage Fade of Layered Oxides: Its Measurement and Impact on Energy Density**, M. Bettge, Y. Li, K. Gallagher, Y. Zhu, Q. Wu, W. Lu, I. Bloom, D. P. Abraham, J. Electrochem. Soc. 160, A2046-A2055 (2013)*
- ***Effect of interface modifications on voltage fade in 0.5Li2MnO3·0.5LiNi0.375Mn0.375Co0.25O2 cathode materials**, I. Bloom, L. Trahey, A. Abouimrane, I. Belharouak, X. Zhang, Q. Wu, W. Lu, D. P. Abraham, M. Bettge, J. Elam, X. Meng, A. K. Burrell, C. Ban, R. Tenent, J. Nanda, N. Dudney, J. Power Sources, 249, 509-514 (2014)*
- ***Nanostructured light-absorbing crystalline $CuIn_{(1-x)}Ga_xSe_2$ thin films grown through high flux, low energy ion irradiation,** A. J. Hall, D. Hebert, A. B. Shah, M. Bettge, A. A. Rockett, J. Appl. Physics 114, 153505 (2013)*
- ***Correlating hysteresis and voltage fade in lithium- and manganese-rich layered transition-metal oxide electrodes,** K. Gallagher, J. Croy, M. Balasubramanian, M. Bettge, D. P. Abraham, A. K. Burrell, M. M. Thackeray, Electrochem. Comm. 33, 96-98 (2013)*
- ***Electrolyte additive combinations that enhance performance of high capacity $Li_{1.2}Ni_{0.15}Mn_{0.55}Co_{0.1}O_2$ – graphite cells,** Y. Zhu, Y. Li, M. Bettge, D. Abraham, Electrochim. Acta, 110, 191-199 (2013)*
- ***Understanding Long-Term Cycling Performance of $Li_{1.2}Ni_{0.15}Mn_{0.55}Co_{0.1}O_2$-Graphite Lithium-ion Cells**, Y. Li, M. Bettge, B. Polzin, Y. Zhu, M. Balasubramanian, D. Abraham, J. Electrochem. Soc. 160, A3009-A3019 (2013)*
- ***Improving high-capacity $Li_{1.2}Ni_{0.15}Mn_{0.55}Co_{0.1}O_2$-based lithium-ion cells by modifiying the positive electrode with alumina**, M. Bettge, Y. Li, B. Sankaran, N. Dietz Rago, T. Spila, R. T. Haasch, I. Petrov, D. Abraham, J. Power Sources 233, 346-357 (2013)*
- ***Positive Electrode Passivation by LiDFOB Electrolyte Additive in High-Capacity Lithium-Ion Cells,** Y. Zhu, Y. Li, M. Bettge, D. Abraham, J. Electrochem. Soc. 159, A2109-A2117 (2012)*
- ***Surface and Line Energy Constraints for Vapor-Liquid-Solid Growth of Amorphous Wires**, M. Bettge, S. MacLaren, S. Burdin, D. Abraham, I. Petrov, M.-F. Yu, E. Sammann (sent to Langmuir)*
- ***Ion-induced surface relaxation: controlled bending and alignment of nanowire arrays,** M. Bettge, S. MacLaren, S. Burdin, R. T. Haasch, D. Abraham, I. Petrov, M.-F. Yu, E. Sammann, Nanotechnol. 23, 175302 (2012)*
- ***Hierarchically textured $Li_xMn_{2-y}O_4$ thin films as positive electrodes for lithium-ion batteries,** M. Bettge, S. Y. Ryu, S. MacLaren, S. Burdin, I. Petrov, M.-F. Yu, E. Sammann, D. P. Abraham, J. Power Sources 206 p. 288– 294 (2012)*
- ***Importance of line and interfacial energies during VLS growth of finely stranded silica nanowires,** M. Bettge, S. MacLaren, S. Burdin, D. Abraham, I. Petrov, M.-F. Yu, E. Sammann, J. Mater. Res., **26,** p. 2247 (2011)*
- ***Low-temperature vapour–liquid–solid (VLS) growth of vertically aligned silicon oxide nanowires using concurrent ion bombardment,** M. Bettge, S. MacLaren, S. Burdin, J.-G. Wen, D. Abraham, I. Petrov, E. Sammann, Nanotechnol. 20, 115607 (2009)*
- ***Synthesis and characterization of polymer encapsulated Cu–Ni magnetic nanoparticles for hyperthermia applications**, J. Chatterjee, M. Bettge, Y. Haik, C. J. Chen, Journal of Magnetism and Magnetic Materials 293, p. 303 (2005)*
- ***Physically synthesized Nickel-Copper Nanoparticles for Magnetic Hyperthermia**, M. Bettge, J. Chatterjee, Y. Haik, Biomagnetic Research and Technology 2:4 (2004)*