

## Adam J. Schwartz

Lawrence Livermore National Laboratory  
Physical and Life Sciences Directorate  
Condensed Matter and Materials Division  
L-353, 7000 East Avenue, Livermore, CA 94550-9234  
925-423-3454  
[schwartz6@llnl.gov](mailto:schwartz6@llnl.gov)

### Research Interests

Accelerating advanced material development and deployment  
Structure - property - processing - performance relationships  
High pressure and dynamic properties of materials  
Critical materials  
Rare earth elements, alloys, and compounds  
Actinide science

### Education

Ph.D., Materials Science and Engineering, University of Pittsburgh, 1991. Dissertation:  
“Magnetization, Coercivity, and Magnetic Viscosity in Co-Ni and Co-Ni-Al Fine Particle  
Ferromagnets”  
M.S., Metallurgical Engineering, University of Pittsburgh, 1989  
B.S., Metallurgical Engineering, University of Pittsburgh, 1985

### Professional Appointments and Leadership Positions

- 2013 – present    **Leadership Team, Developing Substitutes Focus Area Leader**  
**Critical Materials Institute, Ames Laboratory led DOE Energy Innovation Hub**
- Assemble and lead multi-disciplinary and multi-institutional teams for discovering and deploying advanced magnets, phosphors, and for constructing a materials development framework to accelerate advanced materials development and deployment; lead all Lawrence Livermore National Laboratory projects for the Critical Materials Institute
- 2010 – present    **Division Leader, Condensed Matter and Materials Division**  
**Lawrence Livermore National Laboratory**
- Develop and implement a materials strategy that fully integrates validated predictive modeling capabilities, tailored materials synthesis, advanced characterization and testing, and controlled assembly of materials; lead and manage a division of nearly 200 staff; oversee and integrate the execution of research; manage staff development and budgets of approximately \$75M of multiple broad based groups; implement integrated safety management; engage in scientific research and program development; co-develop with Los Alamos National Laboratory an integrated national plutonium science and research strategy

- 2005 – present **Adjunct Research Professor  
Washington State University**
- Develop collaborations with the Institute for Shock for Physics at Washington State University; serve on the Scientific Advisory Board for the Dynamic Compression Sector at the Advanced Photon Source at Argonne National Laboratory; lead the development of the non-single event end station
- 2009 – 2010 **Acting Program Leader for Dynamic Materials Properties  
Lawrence Livermore National Laboratory**
- Developed program and implementation plans; managed the execution of \$20M National Nuclear Security Administration (NNSA) Science Campaign program to execute dynamic material property experiments for equation of state, high pressure deformation and fracture, and high explosive properties; interacted with NNSA program managers and program leaders from Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL)
- 2009 – 2010 **Acting Program Leader for Physics and Engineering Models  
Lawrence Livermore National Laboratory**
- Developed program and implementation plans; managed the execution of \$19M NNSA Advanced Simulation and Computing program to develop and validate predictive models for equation of state, strength, and high explosive performance; interacted with NNSA program managers and program leaders from LANL and SNL
- 2009 – 2010 **Group Leader, Actinide Science and Characterization  
Lawrence Livermore National Laboratory**
- Led the development of the actinide science strategic plan; managed group of 16 staff members; responsible for performance management
- 2005 – 2010 **Project Leader, Phase Transformations and Aging in Pu Alloys  
Lawrence Livermore National Laboratory**
- Characterized the martensitic and pressure-induced phase transformations, radiation damage and aging, electronic structure of Pu, and other actinides
- 2005 – 2008 **Deputy Division Leader, Condensed-Matter and High-Pressure Physics Division  
Lawrence Livermore National Laboratory**
- Directed the scientific research and \$24M budget of Equation of State and Materials Theory, Modeling and Simulations, Quantum Simulations, Shock Physics, and High-Pressure Physics groups; participated in performance management
- 2002 – 2005 **Deputy Program Leader for Enhanced Surveillance – Plutonium Aging  
Lawrence Livermore National Laboratory**
- Led the \$16M/year, 16-project, 50-investigator Pu aging program within the \$24M Enhanced Surveillance Campaign (ESC) at LLNL; delivered presentations (30 - 40 per year) to internal and external panels, reviewers, DOE, and DoD

- 2002 – 2004      **Board of Directors**  
**Valley Children’s Museum, San Ramon, CA**
- Directed the development of the scientific exhibitions
- 1999 – 2002      **Project Leader, Fundamentals of Dynamic Deformation and Failure**  
**Lawrence Livermore National Laboratory**
- Processed high purity copper to produce a range of quantitatively characterized microstructures; systematically determined the influence of specific microstructural parameters on the dynamic deformation and failure properties
- 1997 – 2005      **Task Leader, Plutonium Science and Plutonium Aging**  
**Lawrence Livermore National Laboratory**
- Developed transmission electron microscopy (TEM) capabilities and integrated safety management protocols for Pu and other actinide elements; characterized helium bubble ingrowth using TEM and modeled the time dependence of bubble size and distribution; performed experiments at the APS and European Synchrotron Radiation Facility; experimentally measured the full phonon dispersion curves in a Pu alloy
- 1997 – 2002      **Project Leader, Shaped-Charge Liner Processing and Characterization**  
**Lawrence Livermore National Laboratory**
- Processed copper shaped charge liners to increase performance by 40%; created microstructural model based on tetrakaidecahedron grains to describe the relationship between grain size, impurity content, and performance
- 1997 – 2000      **Project Leader, Grain Boundary Engineering for Improved and Predictable**  
**Materials Properties**  
**Lawrence Livermore National Laboratory**
- Developed unique processing methods to increase the fraction of special grain boundaries in low stacking fault metals and alloys; correlated observations of deformation microstructures by TEM and electron backscatter diffraction (EBSD); proposed mechanism of grain boundary network topology; obtained external funding by the Nuclear Energy Research Initiative and the AFOSR
- 1994 - 1997      **Staff Scientist**  
**Lawrence Livermore National Laboratory**
- Conducted TEM experiments on U-6Nb shape memory alloy, Ti-Al based alloys, magnetic thin films, and nanostructured metals and ceramics; developed EBSD capabilities and applied orientation imaging microscopy to elucidate the role of texture gradients on mechanical properties of Ta and Ta-W alloys
- 1991 – 1994      **Post Doctoral Research Associate**  
**Lawrence Livermore National Laboratory**
- Elucidated the systematics of displacive phase transformations using TEM in Ti-Ni, Ti-Pd, Ni-Al, and NiMnGa alloys; modeled the incommensurately modulated structures

## **Professional Activities, Select Honors, and Awards**

APS, TMS, MRS  
National and International Review Panels (12)  
Symposium Organizer (7)  
LLNL Science, Technology, Engineering, and Operations Award, 2008  
DOE/NNSA/Defense Programs Award of Excellence, 2007  
Lawrence Livermore National Laboratory Science and Technology Award, 2003  
Neill Griffiths Memorial Award, 1998

## **Select Leadership Advancement**

Institute for Management Studies  
Global Institute for Leadership Development  
The Leadership Challenge  
Best Practice Project Management  
LLNL Management Institute  
LLNL Executive Presence  
UCLA Extension  
    Managing Systems Development  
    Cost Estimation of Projects  
    Project Risk and Opportunity Management

## **Patent**

United States Patent Number: US 6,397,682 B2, June 4, 2002, Mukul Kumar, Adam Schwartz, Wayne King, "Intergranular Degradation Assessment Via Random Grain Boundary Network Analysis."

## **Select Plenary, Keynote, and Invited Talks (26)**

2013: Plenary, Critical Materials Institute Workshop, The Ames Laboratory, "Developing Substitutes"  
2013: Invited, Presentation to Tsuneo Nishida – Permanent Mission of Japan to the United Nations, LLNL, "Critical Materials"  
2013: Plenary, LLNL Science Day, LLNL, "Resolving a National Challenge: The Science of Aging Weapons"  
2010: Plenary, Pu Futures 2010 – The Science, A Topical Conference on Plutonium and Actinides, Keystone, Colorado, "Time-Dependent Processes in Pu Alloys: From Femtoseconds to Teraseconds"  
2008: Invited, Pu Futures 2008 – The Science, A Topical Conference on Plutonium and Actinides, Dijon, France, "Isothermal Martensitic and Pressure-Induced  $\delta$  to  $\alpha'$  Phase Transformations in a Pu-Ga Alloy"

- 2008: Invited, Spring 2008 Materials Research Society Meeting, San Francisco, CA, "Low-Temperature Martensitic and Pressure-Induced  $\delta$  to  $\alpha'$  Phase Transformation in a Pu-Ga Alloy"
- 2008: Invited (with T.B. Massalski), Spring 2008 Materials Research Society Meeting, San Francisco, CA, "Structure and Phase Transformations in Pu Alloys"
- 2008: Keynote, Plasticity 2008, Kona, HI, "Isothermal Martensitic and Pressure-Induced  $\delta$  to  $\alpha'$  Phase Transformation in a Pu-Ga Alloy"
- 2006: Invited Tutorial, Fall 2006 Materials Research Society Meeting, Boston, MA, "Opportunities in Plutonium Metallurgical Research"
- 2006: Plenary, Pu Futures 2006 – The Science, A Topical Conference on Plutonium and Actinides, Pacific Grove, CA, "Plutonium Metallurgy: The Materials Science Challenges Bridging Condensed-Matter Physics and Chemistry"
- 2006: Invited Tutorial, Pu Futures 2006 – The Science, A Topical Conference on Plutonium and Actinides, Pacific Grove, CA, "Frontiers of Metallic Plutonium – A Tutorial"
- 2005: Invited, 5th International Workshop: Fundamental Plutonium Properties, Snezhinsk, Russia, "Advanced Transmission Electron Microscopy Characterization of Pu-Alloys"
- 2005: Invited, 5th International Workshop: Fundamental Plutonium Properties, Snezhinsk, Russia, "Transformation Crystallography and Morphology of Isothermal Martensite in Pu-Ga Alloys"
- 2005: Invited Lecturer, CDAC Summer School, Advanced Photon Source, Argonne National Laboratory, "Physics, Materials Science, and Chemistry of Actinides"
- 2004: Invited, Russian – U.S. Workshop on Plutonium Science, Sarov, Russia, "Characterization of Aging Phenomena in Pu-Alloys"
- 2003: Invited, Aging, Compatibility and Stockpile Stewardship Conference, Lawrence Livermore National Laboratory, "Plutonium Aging and Pit Lifetimes"
- 2003: Plenary, Actinides Separation Conference, Berkeley, CA, "Characterization of Aging in Old Plutonium"
- 2002: Invited, ASM International California Meeting, "Electron Backscatter Diffraction"
- 2001: Invited, Denver X-Ray Conference, Steamboat Springs, CO, "An Overview of Electron Backscatter Diffraction"
- 2001: Invited, 19th International Symposium on Ballistics, Interlaken, Switzerland, "Role of Texture in Spin Formed Cu Shaped-Charge Liners"
- 2000: Invited, Microscopy and Microanalysis 2000, Philadelphia, PA, "Coupling Automated Electron Backscatter Diffraction with Transmission Electron and Atomic Force Microscopies"
- 2000: Invited, Northern California Microscopy Society, "Combining Orientation Imaging with TEM and AFM for Materials Characterization"
- 2000: Invited, Orientation Imaging Microscopy Workshop, Salt Lake City, UT, "Coupling Automated Electron Backscatter Diffraction with Transmission Electron and Atomic Force Microscopies"

- 1999: Invited, Fall 1999 Materials Research Society Meeting, Boston, MA, "Influence of Processing Method on the Grain Boundary Character Distribution"
- 1999: Invited, The Minerals, Metals and Materials Society Meeting, Advances in Twinning, San Diego, CA, "Role of Twinning in the Optimization of the Grain Boundary Character Distribution"
- 1998: Invited, 17th International Symposium on Ballistics, Midrand, South Africa, "Analysis of Intergranular Impurity Concentration and the Effects on the Ductility of Copper Shaped Charge Jets"
- 1998: Invited, Pontifical Catholic University of Rio de Janeiro, Brazil, "Electron Backscatter Diffraction Characterization of Texture Gradients in Ta and Ta Alloys"
- 1998: Invited, Johns Hopkins University, Baltimore, MD, "Applications of Orientation Imaging Microscopy and the Potential to Engineer Grain Boundaries"
- 1996: Invited, U.S. Army Symposium on Solid Mechanics, Myrtle Beach, SC, "Mechanical Behavior and Microtexture of Ta and Ta-W Plate"

### **Books (3)**

Schwartz, A.J., Kumar, M., Adams, B.L., and Field, D.P., Editors, *Electron Backscatter Diffraction in Materials Science*, 2<sup>nd</sup> Edition, Springer Publishers, New York (2009). ISBN 978-0-387-88135-5, e- ISBN 978-0-387-88136-2, DOI 10.1007/978-0-387-88136-2.

Sarrao, J., Schwartz, A.J., Antonio, M.R., Burns, P.C., Haire, R.G., and Nitsche, H., Editors, *Actinides 2005 – Basic Science, Applications, and Technology*, Materials Research Society, **893**, 2006.

Schwartz, A.J., Kumar, M., and Adams, B.L., Editors, *Electron Backscatter Diffraction in Materials Science*, Kluwer Academic/ Plenum Publishers, New York, 2000.

### **Book Chapter, Published (2)**

Schwarzer, R.A., Field, D.P., Adams, B.L., Kumar, M., and Schwartz, A.J., Present State of Electron Backscatter Diffraction and Prospective Developments, in: *Electron Backscatter Diffraction in Materials Science*, 2<sup>nd</sup> Edition, A.J. Schwartz, M. Kumar, B.L. Adams, and D.P. Field, eds., Springer Publishers, New York, 1 (2009).

King, W.E., Stölken, J.S., Kumar, M., and Schwartz, A.J., Strategies for analyzing EBSD datasets, in: *Electron Backscatter Diffraction in Materials Science*, A.J. Schwartz, M. Kumar, B.L. Adams, eds., Kluwer Academic/Plenum Publishers, New York, 153 (2000).

### **Guest Editor**

Schwartz, A.J., and Wolfer, W.G., *Journal of Computer-Aided Materials Design*, 14(3), 2007.

## Select Journal Publications (72)

Jeffries, J.R., Manley, M.E., Wall, M.A., Blobaum, K.J.M., and Schwartz, A.J., "Hidden disorder in the  $\alpha' \rightarrow \delta$  transformation of Pu-1.9at. 5 Ga," *Physical Review B*, **85**, 224104 (2012).

Blobaum, K.J.M., Jeffries, J.R., Schwartz, A.J., Cynn, H., Yang, W., Wall, M.A., and Evans, W.J., "In situ X-ray diffraction study of the  $\delta$  to  $\alpha'$  isothermal martensitic transformation kinetics in a Pu- Ga alloy," *Journal of Nuclear Materials*, **412** (3), 84-88 (2011).

Jeffries, J.R., Wall, M.A., Moore, K.T., and Schwartz, A.J., "He bubble coarsening by migration and coalescence in annealed Pu- Ga alloys," *Journal of Nuclear Materials*, **410** (1-3), 327-333 (2011).

Jeffries, J.R., Blobaum, K.J.M., Wall, M.A., and Schwartz, A.J., "Evidence for nascent equilibrium nuclei as progenitors of anomalous transformation kinetics in a Pu-Ga alloy," *Physical Review B*, **80**, 094107 (2009).

Schwartz, A.J., Cynn, H., Blobaum K.J.M., Wall, M.A., Moore, K.T., Evans, W.J., Farber D.L., Jeffries, J.R., and Massalski, T.B., "Atomic structure and phase transformations in Pu alloys," *Progress in Materials Science*, **54**, 909-943 (2009).

Jeffries, J.R., Blobaum, K.J.M., Wall, M.A., and Schwartz, A.J., "Microstructural evidence for conditioning-dependent  $\delta \rightarrow \alpha'$  transformations in retained  $\delta$ -phase Pu-Ga," *Acta Materialia*, **57**, 1831-1842 (2009).

Jeffries, J.R., Blobaum, K.J.M., Wall, M.A., and Schwartz, A.J., "Reproducible phase transformation in a single Pu-1.9 at.% Ga specimen," *Journal of Nuclear Materials*, **384**, 222-225 (2009).

Tobin, J.G., Söderlind, P., Landa, A., Moore, K.T., Schwartz, A.J., Chung, B.W., Wall, M.A., Wills, J.M., Haire, R.G., and Kutepov, A.L., "Electronic structure: wide-band, narrow-band, and strongly correlated systems," *Journal of Physics: Condensed Matter*, **20**, 125204 (2008).

Schwartz, A.J., and Wolfer, W.G., "Toward a Deeper Understanding of Plutonium," *Journal of Computer-Aided Materials Design*, **14**(3), 329-330 (2007).

Schwartz, A.J., and Wolfer, W.G., "Introduction to Modeling and Simulations of Plutonium Aging," *Journal of Computer-Aided Materials Design*, **14**(3), 331-335 (2007).

Schwartz, A.J., "Plutonium Metallurgy: The materials science challenges bridging condensed-matter physics and chemistry," *Journal of Alloys and Compounds*, **444-445C**, 4-10 (2007).

Massalski, T.B., and Schwartz, A.J., "Connections between the Pu- Ga phase diagram in the Pu-rich region and the low temperature phase transformations," *Journal of Alloys and Compounds*, **444-445C**, 98-103 (2007).

Oudot, B., Blobaum, K.J.M., Wall, M.A., and Schwartz, A.J., "Confirmation of the double-C curve kinetics in the isothermal  $\delta \rightarrow \alpha'$  phase transformation in a Pu-Ga alloy using differential scanning calorimetry," *Journal of Alloys and Compounds*, **444-445C**, 230-235 (2007).

Moore, K.T., van der Laan, G., Wall, M.A., Schwartz, A.J., and Haire, R.G., "Rampant changes in 5f<sub>5/2</sub> and 5f<sub>7/2</sub> filling across the light and middle actinide metals," *Physical Review B*, **76**, 073105 (2007).

Moore, K.T., Söderlind, P.A. Schwartz, A.J., and Laughlin, D.E., Comment on "Symmetry and Stability of  $\delta$  Plutonium: The Influence of Electronic Structure," – Reply, *Physical Review Letters*, **99**(1), 019704 (2007).

Moore, K.T., van der Laan, G., Haire, R.G., Wall, M.A., Schwartz, A.J., and Söderlind, P., "Emergence of Strong Exchange Interaction in the Actinide Series: The Driving Force for Magnetic Stabilization of Curium," *Physical Review Letters*, **98**, 236402 (2007).

Moore, K.T., Laughlin, D.E., Söderlind, P., and Schwartz, A.J., "Incorporating anisotropic electronic structure in crystallographic determination of complex metals: iron and plutonium," *Philosophical Magazine*, **87** (17), 2571-2588 (2007).

Moore, K.T., Krenn, C.R., Wall, M.A., and Schwartz, A.J., "Orientation relationship, habit plane, twin relationship, interfacial structure, and plastic deformation resulting from the  $\delta \rightarrow \alpha'$  isothermal martensitic transformation in Pu-Ga alloys," *Metallurgical and Materials Transactions*, **38A**, 212-222 (2007).

Chu, S., Schwartz, A.J., Massalski, T.B., and Laughlin, D.E., "Extrinsic paramagnetic Meissner Effect in multiphase indium-tin alloys," *Applied Physics Letters*, **89**, 111903 (2006). Also published in the September 15, 2006 issue of *Virtual Journal of Applications of Superconductivity*.

Blobaum, K.J.M., Krenn, C.R., Wall, M.A., Massalski, T.B. and Schwartz, A.J., "Nucleation of the  $\alpha'$  phase in Pu-Ga alloys," *Acta Materialia*, **54**, 4001-4011 (2006).

Moore, K.T., Söderlind, P.A. Schwartz, A.J., and Laughlin, D.E., "Symmetry and Stability of  $\delta$  Plutonium: The Influence of Electronic Structure," *Physical Review Letters*, **96**, 206402-1-4 (2006).

Chung, B.W., Schwartz, A.J., Ebbinghaus, B.B., Fluss, M.J., Haslam, J.J., Blobaum, K.J.M, and Tobin, J.G., "Spectroscopic Signature of Aging in  $\delta$ -Pu(Ga), *Journal of the Physical Society of Japan*, **75** (5), 054710 (2006).

Blobaum, K.J.M., Krenn, C.R., Mitchell, J.N., Haslam, J.J., Wall, M.A., Massalski, T.B. and Schwartz, A.J., "Evidence of transformation bursts during thermal cycling of a Pu-Ga alloy," *Metallurgical and Materials Transactions*. **37A**, 567-577 (2006).

Moore, K.T., van der Laan, G., Tobin, J.G., Chung, B.W., Wall, M.A., and Schwartz, A.J., "Probing the population of the spin-orbit split levels in the actinide 5f states," *Ultramicroscopy*, **106**, 261-268 (2006).

Moore, K.T., van der Laan, G., Haire, R.G., Wall, M.A., and Schwartz, A.J., "Oxidation and aging in U and Pu probed by spin-orbit sum rule analysis: Indications for covalent metal-oxide bonds," *Physical Review B*, **73**, 033109 (2006).

Schwartz, A.J., King, W.E., and Kumar, M., "Influence of processing method on the network of grain boundaries," *Scripta Materialia*, **54/6**, 963-968 (2006).

Wong, J., Krisch, M., Farber, D.L., Occelli, F., Xu, R., Chiang, T.-C., Clatterbuck, D., Schwartz, A.J., Wall, M.A., and Boro, C., "Crystal dynamics of  $\delta$  fcc Pu-Ga by high resolution inelastic x-ray scattering," *Physical Review B*, **72**, 064115 (2005).

Kim, T.K., Wells, J., Kirkegaard, C., Li, Z., Hoffmann, S.V., Gayone, J.E., Fernandez-Torrente, I., Häberle, P., Pascual, J.I., Moore, K.T., Schwartz, A.J., He, H., Spence, J.C.H., Downing, K.H., Lazar, S., Tichelaar, F.D., Borisenko, S.V., Knupfer, M., and Hofmann, Ph., "Evidence against a charge density wave on Bi (111)," *Physical Review B*, **72**, 085440 (2005).

Schwartz, A.J., Wall, M.A., Zocco, T.G., and Blobaum, K.J.M., "Transmission Electron Microscopy Characterization of Helium Bubbles in Aged Plutonium," *Materialovedenie*, **7**, 42-53 (2005).

Tobin, J.G., Moore, K.T., Chung B.W., Wall, M.A., Schwartz, A.J., van der Laan, G., and Kutepov, A.L., "Competition Between Delocalization and Spin-Orbit Splitting in the Actinide 5f States," *Physical Review B*, **72**, 085109 (2005).

Jin, Y.M., Wang, Y.U., Khachatryan, A.G., Krenn, C.R., and Schwartz, A.J., "Crystallography of the  $\delta \rightarrow \alpha$  Martensitic Transformation in Plutonium Alloys," *Metallurgical and Materials Transactions A*, **36A**, 2031-2047 (2005).

Schwartz, A.J., Wall, M.A., Zocco, T., Schaldach, C., and Wolfer, W.G., "Characterization and Modeling of Helium Bubbles in Self-Irradiated Plutonium Alloys," *Philosophical Magazine*, **85** (4-7) 479-488 (2005).

Arsenlis, A., Wolfer, W.G., and Schwartz, A.J., "Change in Flow Stress and Ductility of  $\delta$ -Phase Pu-Ga Alloys due to Self-Irradiation Damage," *Journal of Nuclear Materials*, **336**, Issue 1, 31-39 (2005).

Schwartz, A.J., Kumar, M., and Lassila, D.H., "Analysis of Intergranular Impurity Concentration and the Effects on the Ductility of Copper Shaped Charge Jets," *Metallurgical and Materials Transactions A*, **35A**, 2567-2573 (2004).

Minich, R.W., Cazamias, J.U., Schwartz, A.J., and Kumar, M., "Effect of Microstructural Length Scales on Spall Strength of Copper," *Metallurgical and Materials Transactions A*, **35A**, 2663-2673 (2004).

van der Laan, G., Moore, K.T., Tobin, J.G., Chung, B.W., Wall, M.A., and Schwartz, A.J., "Applicability of the spin-orbit sum rule for the actinide 5f states," *Physical Review Letters*, **93**, (9) 097401-1-4 (2004).

Hsiung, L.M., Schwartz, A.J., and Nieh, T.G., "In situ TEM observations of interface sliding and migration in a refined lamellar TiAl alloy," *Intermetallics*, **12**, 727-732 (2004).

Moore, K.T., Chung, B.W., Morton, S.A., Schwartz, A.J., Tobin, J.G., Lazar, S., Tichelaar, F.D., Zandbergen, H.W., Söderlind, P., and Van der Laan, G., "Changes in the electronic structure of cerium due to variations in close-packing," *Physical Review B*, **69**, 193104 (2004).

Wong, J., Wall, M., Schwartz, A.J., Xu, R., Holt, M., Hong, H., Zschack, P., and Chiang, T.-C., "Imaging of phonons in fcc Pu-Ga alloy by thermal diffuse x-ray scattering," *Applied Physics Letters*, **84**, No. 18, 3747-3749 (2004).

Moore, K.T., Wall, M.A., Schwartz, A.J., Chung, B.W., Morton, S.A., Tobin, J.G., Lazar, S., Tichelaar, F.D., Zandbergen, H.W., Söderlind, P., and van der Laan, G., "Electron-energy-loss and X-ray absorption spectroscopy as complementary probes for complex f- electron metals: cerium and plutonium," *Philosophical Magazine*, **84**, No. 10, 1039-1056 (2004).

Dave, V.R., Cola, M.J., Kumar, M, Schwartz, A.J., and Hussen, G.N.A., "Grain boundary character in Alloy 690 and ductility-dip cracking susceptibility," *WELDING JOURNAL*, **B** (1), 1S-5S (2004).

Nelson, E.J., Blobaum, K.J.M., Wall, M.A., Allen, P.G., Schwartz, A.J., and Booth, C.H., "Local structure and vibrational properties of  $\alpha'$ -Pu martensite in Ga stabilized  $\delta$ -Pu," *Physical Review B*, **67**, 224206 (2003).

Martz, J.C., and Schwartz, A.J., "Plutonium: Aging Mechanisms and Weapon Pit Lifetime Assessment," *JOM*, **55**, No. 9, 19-23 (2003).

Zocco, T.G., and Schwartz, A.J., "A Brief History of TEM Observations of Plutonium and Its Alloys," *JOM*, **55**, No. 9, 24-27 (2003).

Wong, J., Krisch, M., Farber, D.L., Occelli, F., Schwartz, A.J., Chiang, T.-C., Wall, M.A., Boro, C., and Xu, R., "Phonon Dispersions of fcc  $\delta$ -Plutonium-Gallium by Inelastic X-ray Scattering," *Science*, **301**, 1078-1080 (2003).

Moore, K.T., Wall, M.A., Schwartz, A.J., Chung, B.W., Schulze, R.K., and Tobin, J.G., "The Failure of Russell-Saunders Coupling in the 5f States of Plutonium," *Physical Review Letters*, **90**, Number 19, 196404 (2003).

Moore, K.T., Wall, M.A., and Schwartz, A.J., "Experimental verification of the existence and structure of  $\zeta$  Pu<sub>6</sub>Fe in a Pu-Ga alloy using electron diffraction and EDXS in a TEM," *Journal of Nuclear Materials*, **306**, Issues 2-3, 213-217 (2002).

Kumar, M., Schwartz, A.J., and King, W.E., "Microstructural Evolution in FCC Materials During Sequential Thermomechanical Processing: Implications for Grain Boundary Engineering," *Acta Materialia*, Vol. **50**, 2599-2612 (2002).

Terminello, L.J., Caturla, M.J., Fluss, M.J., Gouder, T., Haire, R.G., Haschke, J.M., Hecker, S.S., Lander, G., Rebizant, J., Schwartz, A.J., Silva, R.J., Wall, M.A., Wastin, F., Weber, W.J., Wirth, B.D., and Wolfer, W.G., "Challenges in plutonium and actinide materials science," *MRS Bulletin*, **26**, No. 9, 667–671 (2001).

Wirth, B.D., Schwartz, A.J., Fluss, M.J., Caturla, M.J., Wall, M.A., and Wolfer, W.G., "Fundamental Studies of Plutonium Aging," *MRS Bulletin*, **26**, No. 9, 679–683 (2001).

Kumar, M., Schwartz, A.J., and King, W.E., "Correlating observations of deformation microstructures by TEM and automated EBSD techniques," *Materials Science and Engineering A*, **A309-310**, 78-81 (2001).

Wall, M.A., Schwartz, A.J., and Nguyen, L., "A High-Resolution Serial Sectioning Preparation Technique for Application to Electron Backscatter Diffraction," *Ultramicroscopy*, **88**, 73-83 (2001).

Schwartz, A.J., Stölken, J.S., King, W.E., and Campbell, G.H., "Lattice rotations during the compression deformation of a [011] Ta single crystal," *Materials Science and Engineering A*, Volume **A317**, 77-84 (2001).

Kumar, M., Schwartz, A.J., and King, W.E., "Modifications to the microstructural topology in F.C.C. materials through thermomechanical processing," *Acta Materialia*, **48**, 2081 (2000).

Schwartz, A.J., King, W.E., Campbell, G.H., Stölken, J.S., Lassila, D.H., Sun, S., and Adams, B.L., "Orientation imaging microscopy investigation of the compression deformation of a [110] Ta single crystal," *Transactions of the ASME, Journal of Engineering Materials and Technology*, **121**, 178 (1999).

Kumar, M., Sriram, S., Schwartz, A.J., and Vasudevan, V.K., "Weak- beam analysis of dissociated  $1/2\langle 112 \rangle$  superdislocations in  $\gamma$ -TiAl," *Philosophical Magazine Letters*, **79**, No. 6, 315 (1999).

Schwartz, A.J., Lassila, D.H., and LeBlanc, M.M., "The effects of tungsten addition on the microtexture and mechanical behavior of tantalum plate," *Materials Science and Engineering A*, **244**, 178 (1998).

Schwartz, A.J., and King, W.E., "On the potential to engineer grain boundaries through thermomechanical processing," *Journal of Metals*, **50**, No. 2, 50 (1998).

King, W.E., and Schwartz, A.J., "Toward optimization of the grain boundary character distribution in OFE copper," *Scripta Materialia*, **38**, No. 3, 449 (1998).

Hsuing, L.M., Schwartz, A.J., and Nieh, T.G., "In situ observation of deformation-induced interface migration in a fully-lamellar TiAl alloy," *Scripta Materialia*, **36**, No. 9, 1017 (1997).

Nieh, T.G., Schwartz, A.J., and Wadsworth, J., "Superplasticity in a 17 vol % SiC particulate-reinforced ZK60A magnesium composite (ZK60/SiC/17p)," *Materials Science and Engineering A*, **208**, 30 (1996).

- Wang, J.N., Schwartz, A.J., and Nieh, T.G., "Reduction of primary creep in TiAl alloys by prestraining," *Materials Science and Engineering A*, **206**, 63 (1996).
- Schwartz, A.J., Paciornik, S., Kilaas, R., and Tanner, L.E., "Quantification of the modulated structures in TiPdCr alloys," *Journal of Microscopy*, **180**, Pt. 1, 51 (1995).
- Zheludev, A., Shapiro, S.M., Wochner, P., Schwartz, A., Wall, M., and Tanner, L.E., "Phase transformation and phonon anomalies in Ni<sub>2</sub>MnGa," *Journal de Physique IV*, **5**, C8-1139 (1995).
- Zheludev, A., Shapiro, S.M., Wochner, P., Schwartz, A., Wall, M., and Tanner, L.E., "Phonon anomaly, central peak, and microstructures in Ni<sub>2</sub>MnGa," *Physical Review B*, **51**, No. 17, 11311 (1995).
- Schwartz, A.J., and Tanner, L.E., "Phase transformations and phase relations in the TiPd - TiCr pseudobinary system: experimental observations," *Scripta Metallurgica et Materialia*, **32**, No. 5, 675 (1995).
- Lou, P., Nieh, T.G., Schwartz, A.J., and Lenk, T.J., "Surface characterization of nanostructured metal and ceramic particles," *Materials Science and Engineering A*, **204**, 59 (1995).
- Kilaas, R., Paciornik, S., Schwartz, A.J., and Tanner, L.E., "Quantitative analysis of atomic displacements in HRTEM images," *Journal of Computer Assisted Microscopy*, **6**, No. 3, 129 (1994).
- Duan, S., Zhang, B., Gao, C., Rauch, G., Pressesky, J., and Schwartz, A.J., "Study of magnetic recording media on glass substrates," *IEEE Transactions on Magnetics*, **30**, No. 6, 3966 (1994).
- Schwartz, A.J., and Soffa, W.A., "Decomposition of beta-phase Co- Al alloys: precipitate crystallography and morphology," *Scripta Metallurgica et Materialia*, **25**, 185 (1991).
- Schwartz, A.J., and Soffa, W.A., "Magnetic viscosity studies of cobalt-aluminum fine-particle ferromagnets," *IEEE Transactions on Magnetics*, **26**, No. 5, 1816 (1990).
- Zeltzer, A.M., Schwartz, A.J., and Soffa W.A., "The decomposition of Beta-Phase Co-Al alloys and Fine-Particle Ferromagnets," *Journal of Metals*, **39** (7) A37, 1987.