

KATAYUN (KATY) BARMAK

Department of Applied Physics and Applied Mathematics
Seeley W. Mudd Building
Columbia University
500 West 120th Street, Suite 200
New York, NY 10027
Tel: (212) 854-8267
E-mail: katayun.barmak@columbia.edu or kb2612@columbia.edu

EDUCATION

Ph.D., Materials Science, Massachusetts Institute of Technology, 1989
M.A., University of Cambridge, England, 1987
S.M., Metallurgy, Massachusetts Institute of Technology, 1985
B.A., Materials Science, 1st Class Honours, University of Cambridge, England, 1983

PROFESSIONAL EXPERIENCE

2013-present Director, Materials Science and Engineering Program,
Dept. of Applied Physics and Applied Mathematics, Columbia University

2011-present Philips Electronics Professor of Applied Physics and Applied Mathematics
and Materials Science and Engineering, Columbia University

2002-2011 Full Professor with indefinite tenure, Carnegie Mellon University

1999-2002 Associate Professor with indefinite tenure, Carnegie Mellon University

1997-1998 Associate Professor with indefinite tenure, Lehigh University

1995-1998 Co-director, Thin Film Laboratory, Materials Research Center, Lehigh

1992-1997 Assistant Professor, Lehigh University

1989-1992 Staff Engineer, Advanced Device Development, IBM T. J. Watson
Research Center and IBM East Fishkill, New York.
R&D of materials, processes and structures for advanced generations of
bipolar junction and field effect transistors

HONORS AND AWARDS

2017 Edward and Carole Kim Faculty Involvement Award, Columbia University
The Kim Award, established in 2000 by Edward and Carole Kim, was
created to honor a faculty member who is not only an excellent teacher, but
who also shows a special, personal commitment to students.

2009 Philbrook Prize in Engineering, Carnegie Mellon University

Awarded for substantial, sustained contributions to excellence in education, or to the application of materials science to important problems.

2004	IBM Materials Research Community Visiting Scientist, IBM T. J. Watson Research Center (one of only two faculty awards made worldwide)
1998-2003	Visiting Scientist, IBM T.J. Watson Research Center
2001	NSF Creativity Award
1999	Meeting Chair, Materials Research Society, Spring 1999
1999	IBM Faculty Fellowship Award
1998-2000	Materials Research Society Council, elected member
1995	Alfred Noble Robinson Award, Recognizing outstanding performance in the service of the university and unusual promise of professional achievement, Lehigh University
1994	National Young Investigator (NYI) Award, National Science Foundation
1994	Deutsche Forschungsgemeinschaft Fellowship Institute of Materials, GKSS Research Center, Geesthacht, Germany
1992-1993	Harold Chambers Junior Faculty Chair of Materials Science and Engineering, Lehigh University
1986-1989	AT&T Foundation Fellowship
1985	Elected to Sigma Xi, Science Honor Society
1983	New Hall Prize for academic excellence, University of Cambridge
1981-1983	Posener Academic Scholarship, New Hall, University of Cambridge

MEMBERSHIP OF PROFESSIONAL SOCIETIES

IEEE, Materials Research Society (MRS); American Physical Society (APS), The Minerals, Metals, Materials Society (TMS); ASM International (ASM), Microscopy Society of America (MSA); Microbeam Analysis Society (MAS); American Association for the Advancement of Science (AAAS); New York Academy of Science (NYAS); American Society for Engineering Education (ASEE), Sigma Xi

RESEARCH INTERESTS

Synthesis and characterization of transition metal dichalcogenides; synthesis, processing, properties, crystal structure, grain structure, and texture of metallic films for electronic and magnetic applications; thermodynamics and kinetics of solid state reactions and phase transformations in nanostructured films. Grain boundaries, grain growth and microstructural evolution. Electrochemical methods and electrodes for electronic recycling and carbon dioxide reduction. Characterization techniques of interest include differential scanning calorimetry (DSC), X-ray and electron diffraction (XRD, ED), and electron microscopy (SEM, TEM, STEM) and crystal orientation mapping.

PATENTS, PROVISIONAL PATENTS and DISCLOSURES

4. **U.S. Patent 9,117,821** - Oriented Crystal Nanowire Interconnects

Inventors: Barmak, Katayun, Choi, Dooho, Coffey, Kevin R.

3. Thin-Film Media Structures for Perpendicular Magnetic Recording and Storage Devices Made Herewith

- U.S. Nonprovisional Application No. 14/346,247; Filed: 3/20/2014, U.S. National Phase of PCT/US2012/05671, CMU Ref. Nos. 2012-031 and 2012-12, Inventors: Granz, Steven D., Barmak, Katayun, Kryder, Mark H. (Response to final office action 3/26/2015)

2. Rare Earth-Free Permanent Magnetic Material based on FeNi

- International patent PCT/US2012/046935 filed on 7/16/2012. Inventors: Barmak, Katayun, Lewis, Laura.
- European patent filed on 3/17/2017.

1. **US Patent 6,846,734** - Method and process to make multiple-threshold metal gates CMOS technology

- Inventors: Amos, Ricky; Barmak, Katayun; Boyd, Diane C.; Cabral, Jr., Cyril; Leong, Meikei; Kanarsky, Thomas S.; Kedzierski, Jakub Tadeusz

BOOKS and BOOK CHAPTERS

5. Orientation Mapping, A. D. Rollett and K. Barmak, Chapter in Physical Metallurgy, eds. D. Laughlin, K. Hono, Elsevier, 2014. Print Book ISBN: 9780444537706, eBook ISBN: 9780444537713

4. Metallic Films for Electronic, Magnetic, Optical and Thermal Applications: Structure, Processing and Properties, eds. K. Barmak, K. R. Coffey, Woodhead Publishing Ltd. (now Elsevier), 2014.

ISBN 978-0-85709-057-7 (print)

ISBN 978-0-85709-629-6 (online)

- 3 Chapters by Barmak
 - Crystal Orientation Mapping in Scanning and Transmission Electron Microscopes
 - Post-Deposition Grain Growth in Metallic Films
 - Disorder-order Transformations in Metallic Films

3. Hollow-cone dark-field transmission electron microscopy for grain size and dislocation-density quantification of nanocrystalline materials, B. Yao, H. Heinrich, K. Barmak, K. R. Coffey, Kyu Cho, and Y.H. Sohn, in "Microscopy: Science, Technology, Applications and Education, A. Méndez-Vilas, and J. Díaz (Eds), , (Formatex Research Center, Badajoz, Spain, 2010). Vol. 2, pp. 1319-1326. ISBN (13): 978-84-614-6190-5

2. Magnetic Ultrathin Films, Multilayers and Surfaces - 1997, eds. J. Tobin, D. Chambliss, D. Kubinski, K. Barmak, P. Dederichs, W. de Jonge, T. Katayama, A. Schuhl, Materials Research Society Symposium Proceedings **475** (1997) pp. 1-622.

1. Polycrystalline Thin Films: Structure, Texture, Properties and Applications, eds. K. Barmak, M.

A. Parker, J. A. Floro, R. Sinclair, D. A. Smith, Materials Research Society Symposium Proceedings **343** (1994) pp. 1-772.

PUBLICATIONS IN ARCHIVAL JOURNALS

155. A. P. Warren, X. Liu, V. Kamenini, K. R. Coffey, K. Barmak, M. F. Toney, Coherently Scattering Domain Size vs. Grain Size in Thin Metallic Films: A Comparative Study by X-ray Diffraction and Transmission Electron Microscopy, in preparation.

154. D. Edelberg, D. Rhodes, A. Kerelsky, B. Kim, J. Wang, A. Zangiabadi, C. Kim, A. Abhinandan, J. Ardelean, M. Scully, D. Scullion, L. Embon, I. Zhang, R. Zu, E. Santos, C. Marianetti, K. Barmak, X.-Y. Zhu, J. Hone, A. N. Pasupathy, “Strongly Enhanced Light Emission via Defect Control in Monolayer Transition-Metal Dichalcogenides, submitted for publication.

153. Evan J. Telford, Avishai Benyamin, Daniel Rhodes, Da Wang, Younghun Jung, Simon Turkel, Amirali Zangiabadi, Kenji Watanabe Takashi Taniguchi, Shuang Jia, Katayun Barmak, Abhay N. Pasupathy, Cory R. Dean, James Hone, “Via Method for Lithography Free Contact and Preservation of 2D Materials”, in press.

152. (*Invited*) K. Barmak, M. Emelianenko, Y. Epshteyn, D. Kinderlehrer, S. Ta'asan, “Towards a Gradient Flow for Microstructure”, Rendiconti di Matematica, Serie (2018).

151. Katayun Barmak, Jiaying Liu, “Impact of deposition rate, underlayers and substrates on β -W formation in sputter deposited films”, J. Vac. Soc. Technol. A 35, 061516 (2017).
DOI: 10.1116/1.5003628

150. D. Choi, K. Barmak, “On the Potential of Tungsten as Next-generation Semiconductor Interconnects”, Electronic Mater. Lett. 13, 449-456 (2017).
DOI 10.1007/s13391-017-1610-5

149. Jyotirmoy Mandal, Derek Wang, Adam C. Overvig, Norman N. Shi, Daniel Paley, Amirali Zangiabadi, Qian Cheng, Katayun Barmak, Nanfang Yu, and Yuan Yang, “Scalable, “Dip-and-Dry” Fabrication of a Wide-Angle Plasmonic Selective Absorber for High-Efficiency Solar-Thermal Energy Conversion”, Adv. Mater. 1702156 (2017).
DOI: 10.1002/adma.201702156

148. Katayun Barmak, Jiaying Liu, Liam Harlan, Penghao Xiao, Juliana Duncan, Graeme Henkelman, “Transformation of Topologically Close-Packed β -W to Body-Centered Cubic α -W: Comparison of Experiments and Computations”, J. Chem. Phys. **147**, 152709 (2017).
DOI: 10.1063/1.4995261

147. Gregory S. Rohrer, Xuan Liu, Jiaying Liu, Amith Darbal, Madeleine N. Kelly, Xiwen Chen, Michael A. Berkson, Noel T. Nuhfer, Kevin R. Coffey, and Katayun Barmak, “The grain boundary character distribution of a highly twinned nanocrystalline aluminum thin film compared to bulk microcrystalline aluminum”, J. Mater. Sci. **52**, 9819–9833 (2017).

DOI: 10.1007/s10853-017-1112-8

146. Emi Leung, Akiko Shimizu, Katayun Barmak, Robert Farrauto, “Copper oxide catalyst supported on niobium oxide for CO oxidation at low temperatures”, *Catalysis Today* **97**,42-46 (2017).

DOI: <http://dx.doi.org/10.1016/j.catcom.2017.04.008>

145. Sutatch Ratanaphan, Theerayut Boonkird, Rajchawit Sarochawikasisit, Hossein Beladi, Katayun Barmak, Gregory S Rohrer, “Atomistic Simulations of grain boundary energies in tungsten”, *Materials Lett.* **186**, 116-118 (2017).

DOI: <http://dx.doi.org/10.1016/j.matlet.2016.09.104>

144. J. M. Rickman, K. Barmak, “Kinetics of first-order phase transitions with correlated nuclei”, *Phys. Rev. E* **95**, 022121 (2017).

DOI: 10.1103/PhysRevE.95.022121

143. Emi Leung, Qiyuan Lin, Robert Farrauto, Katayun Barmak, “Oxygen storage and redox properties of Nb-doped ZrO₂-CeO₂-Y₂O₃ solid solutions for three-way automobile exhaust catalytic converters”, *Catalysis Today* **277**, 227-233 (2016).

DOI: <http://dx.doi.org/10.1016/j.cattod.2016.08.017>

142. J. Liu, M. Rezaeeyazdi, L. Riddiford, C. Floristean, F. Goncalves-Neto, L. H. Lewis, K. Barmak, “Order-disorder transformation kinetics of FeNi₃”, *J. Alloys and Compounds* **689**, 593-598 (2016).

DOI: <http://dx.doi.org/10.1016/j.jallcom.2016.08.036>

141. K. Barmak, X. Liu, A. Darbal, D. Choi, N. T. Nuhfer, T. Sun, A. P. Warren, K. R. Coffey, M. F. Toney, “On increased twin density and resistivity of Ta₃₈Si₁₄N₄₈-encapsulated nanometric Cu films”, *J. Appl. Phys.* **120**, 065106 (2016).

DOI: <http://dx.doi.org/10.1063/1.4960701>

140. Ana Maria Montes-Arango, Luke G. Marshall, A. D. Fortes, Nina Bordeaux, Sean Langridge, Katayun Barmak, Laura H. Lewis, “Discovery of process-induced tetragonality in equiatomic FeNi”, *Acta Mater.* **116** 263-269 (2016).

DOI: <http://dx.doi.org/10.1016/j.actamat.2016.06.050>

139. N. Bordeaux, A. M. Montes-Arango, J. Liu, K. Barmak, L. H. Lewis “Thermodynamic and kinetic parameters of the chemical order-disorder transformation in L₁₀ FeNi (tetrataenite)”, *Acta Mater.* **103**, 608-615 (2016).

DOI: <http://dx.doi.org/10.1016/j.actamat.2015.10.042>

138. J. Liu, K. Barmak, “Topologically close-packed phases: Deposition and formation mechanism of metastable β-W in thin films”, *Acta Mater.* **103**, 223-227 (2016).

DOI: <http://dx.doi.org/10.1016/j.actamat.2015.11.049>

137. A. M. Montes-Arango, N. Bordeaux, J. Liu, K. Barmak, L. H. Lewis, “L₁₀ phase formation in ternary FePdNi alloys”, *J. Alloys and Compounds* **648**, 845-852 (2015).

DOI: <http://dx.doi.org/10.1016/j.jallcom.2015.07.019>

136. Eric Poirier, Frederick E. Pinkerton, Robert Kubic, Raja K. Mishra, Nina Bordeaux, Arif Mubarak, Laura H. Lewis, Joseph I. Goldstein, Ralph Skomski and Katayun Barmak, “Intrinsic magnetic properties of L₁₀ FeNi obtained from meteorite NWA 6259”, *J. Appl. Phys.* **117**, 17E318 (2015).

DOI: <http://dx.doi.org/10.1063/1.4916190>

135. J. Liu, K. Barmak, “Method for measurement of diffusivity: Calorimetric studies of Fe/Ni multilayer thin films” *Scripta Mater.* **104**, 1-4 (2015).

DOI: <http://dx.doi.org/10.1016/j.scriptamat.2015.02.031>

134. X. Liu, N. T. Nuhfer, A. P. Warren, M. F. Toney, K. R. Coffey, G. S. Rohrer and K. Barmak, “Grain size dependence of the twin length fraction in nanocrystalline Cu thin films via transmission electron microscopy based orientation mapping”, *J. Mater. Res.* **30**, 528-537 (2015).

DOI: 10.1557/jmr.2014.393

133. J. Liu, K. Barmak “Interdiffusion in nanometric Fe/Ni multilayer films”, *J. Vac. Sci. Technol. A* **33**, 021510:1-4 (2015).

DOI: 10.1116/1.4905465

132. L. H. Lewis, F. E. Pinkerton, N. Bordeaux, A. Mubarak, E. Poirier, J. Goldstein, R. Skomski, and K. Barmak, “De Magnete et Meteorite: Cosmically motivated materials”, *IEEE Magn. Lett.* **5**, 5500104 (2014).

DOI: 10.1109/LMAG.2014.2312178

131. K. Barmak, A. Darbal, K. J. Ganesh and P. J. Ferreira, T. Sun, B. Yao, A. P. Warren, K. R. Coffey, J. M. Rickman, “Surface and grain boundary scattering in nanometric Cu thin films: A quantitative analysis including twin boundaries”, *J. Vac. Sci. Technol. A* **32**, 061503:1-8 (2014).

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130. X. Liu, A. P. Warren, N. T. Nuhfer, A. D. Rollett, K. R. Coffey and K. Barmak, “Comparison of crystal orientation mapping-based and image-based measurement of grain size and grain size distribution in a thin aluminum film”, *Acta Mater.* **79**, 138-145 (2014).

DOI: <http://dx.doi.org/10.1016/j.actamat.2014.07.014>

129. D. Choi, X. Liu, P. K. Schelling, K. R. Coffey and K. Barmak, “Failure of semiclassical models to describe resistivity of nanometric, polycrystalline tungsten films”, *J. Appl. Phys.* **115**, 104308:1-7 (2014).

DOI: 10.1063/1.4868093

128. X. Liu, N. T. Nuhfer, J. S. Carpenter, A. Darbal, J. E. Ledonne, S. B. Lee, A. D. Rollett, K. Barmak, “Interfacial orientation and misorientation relationships in nanolamellar Cu/Nb

composites using transmission electron microscope based orientation and phase mapping”, *Acta Mater.* **64**, 333-344 (2014).

DOI: <http://dx.doi.org/10.1016/j.actamat.2013.10.046>

127. R. Backofen, K. Barmak, K. R. Elder, A. Voigt, “Grain growth beyond Mullins, capturing the complex physics behind the universal grain size distributions in thin metallic films”, *Acta Mater.* **64**, 72-77 (2014).

DOI: <http://dx.doi.org/10.1016/j.actamat.2013.11.034>

126. K. Barmak, B. Wang, A. T. Jesanis, D. C. Berry, J. M. Rickman, “Quantitative kinetic models of the A1 to L1₀ transformation in FePt and related ternary alloy films”, *IEEE Trans. Magn.* **50**, 2001104:1-4 (2014).

DOI: 10.1109/TMAG.2013.2279132

125. L. H. Lewis, A. Mubarak, E. Poirier, N. Bordeaux, P. Manchanda, A. Kashyap, R. Skomski, J. Goldstein, F. E. Pinkerton, R. K. Mishra, R. C. Kubic Jr, and K. Barmak, “Inspired by nature: investigating tetrataenite for permanent magnet applications”, *J. Phys.: Condens. Matter* **26**, 064213 (2014)

DOI: 10.1088/0953-8984/26/6/064213

124. J. M. Rickman, K. Barmak, “Simulation of metallic conduction in polycrystalline metallic films”, *J. Appl. Phys.* **114**, 133703:1-6 (2013).

DOI: 10.1063/1.4823985

123. D. Choi, M. Moneck, X. Liu, S.-J. Oh, C. R. Kagan, K. R. Coffey and K. Barmak, “Crystallographic anisotropy of the resistivity size effect in single crystal tungsten nanowires”, *Scientific Reports* **3**, 2591:1-4 (2013).

DOI: <http://10.1038/srep02591>

122. S. Donegan, J. C. Tucker, A. D. Rollett, and K. Barmak, “Extreme value analysis of tail departure from log-normality in experimental and simulated grain size distributions”, *Acta Mater.* **61**, 5595–5604 (2013).

DOI: <http://dx.doi.org/10.1016/j.actamat.2013.06.001>

121. X. Liu, D. Choi, H. Beladi, N. T. Nuhfer, G. S. Rohrer, K. Barmak, “The five parameter grain boundary character distribution of nanocrystalline tungsten”, *Scripta Mater.* **69**, 413-416 (2013).

DOI: <http://dx.doi.org/10.1016/j.scriptamat.2013.05.046>

120. (*Review Article*) K. Barmak, E. Eggeling, D. Kinderlehrer, R. Sharp, S. Ta’asan, A. D. Rollett, K. R. Coffey “Grain Growth and the Puzzle of its Stagnation in Thin Films: The Curious Tale of a Tail and an Ear”, *Progress in Mater. Sci.* **58**, 987-1055 (2013).

DOI: <http://dx.doi.org/10.1016/j.pmatsci.2013.03.004>

119. L. Li, X. Liu, Y. Zhang, N. T. Nuhfer, K. Barmak, P. A. Salvador, G. S. Rohrer, “Visible light photochemical activity of heterostructured core-shell materials composed of selected ternary titanates and ferrites coated by TiO₂”, *ACS Applied Materials and Interfaces* **5**, 5064-5071 (2013).

DOI: dx.doi.org/10.1021/am4008837

118. (*Invited*) P. Manchanda, P. K. Sahota, A. Kashyap, M. J. Lucis, J. E. Shield, A. Mubarak, J. I. Goldstein, S. Constantinides, K. Barmak, L. H. Lewis, D. J. Sellmyer, and R. Skomski, “Intrinsic Properties of Fe-Substituted L₁₀ Magnets”, IEEE Trans. Mag. **49**, 5194-5198 (2013).

DOI: 10.1109/TMAG.2013.2261821

117. (*Invited*) K. Barmak, B. Wang, A. T. Jesanis, D. C. Berry and J. M. Rickman, “L₁₀ FePt: Ordering, anisotropy constant and their relation to film composition”, IEEE Trans. Mag. **49**, 3284-3291 (2013).

DOI:10.1109/TMAG.2013.2242445

116. S. D. Granz, K. Barmak and M. H. Kryder, “Granular FePt:X(X = Ag, B, C, SiO_x, TiO_x) thin films for heat assisted magnetic recording”, Eur. Phys. J. B **86**, 81:1-7(2013).

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115. A. D. Darbal, K. J. Ganesh, X. Liu, S.-B. Lee, J. Ledonne, T. Sun, B. Yao, A. P. Warren, G. S. Rohrer, A. D. Rollett, P. J. Ferreira, K. R. Coffey, and K. Barmak, “Grain boundary character distribution of nanocrystalline Cu thin films using stereological analysis of transmission electron microscope orientation maps”, Micros. Microanal. **19**, 111-119 (2013).

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114. D. Choi, C.-S. Kim, S. Chung, A. P. Warren, N. T. Nuhfer, M. F. Toney, K. R. Coffey and K. Barmak, “The electron mean free path of tungsten and the resistivity of epitaxial (110) tungsten films”, Phys. Rev. B **86**, 04532:1-5 (2012).

DOI: 10.1103/PhysRevB.86.045432

113. J. S. Carpenter, X. Liu, A. Darbal, N.T. Nuhfer, R. J. McCabe, S. C. Vogel, J. E LeDonne, A. D. Rollett, K. Barmak, I. J. Beyerlein, N.A. Mara, “A comparison of texture results obtained using precession electron diffraction and neutron diffraction methods at diminishing length scales in ordered bi-metallic nanolamellar composites”, Scripta Mater. **67**, 336-339 (2012).

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112. J. M. Rickman, K. Barmak, “Resistivity in rough metallic thin films: A Monte Carlo study”, J. Appl. Phys. **112**, 013704 (2012).

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111. K. J. Ganesh, A. Darbal, S. Rajasekhara, G. S. Rohrer, K. Barmak and P. J. Ferreira, “Effect of downscaling copper interconnects on the microstructure revealed by high resolution TEM-orientation-mapping”, Nanotechnology **23**, 134702:1-7 (2012).

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110. B. Wang, K. Barmak, “The impact of deposition temperature on L₁₀ formation in FePt films”, J. Appl. Phys. **111**, 07B718:1-3 (2012).

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109. S Granz, K. Barmak, M. Kryder, “Granular L₁₀ FePt-B and FePt-Ag (001) thin films for heat assisted magnetic recording”, J. Appl. Phys. **111**, 07B709-1:3 (2012).
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108. A. P. Warren, T. Sun, B. Yao, K. Barmak, M. F. Toney, and K. R. Coffey, “Evolution of nanoscale roughness in Cu/SiO₂ and Cu/Ta interfaces”, Appl. Phys. Lett. **100**, 024106 (2012).
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107. D. Choi, K. Barmak, A. Darbal, X. Liu, A. Warren, K. R. Coffey, “Phase, grain structure, stress, and resistivity of sputter-deposited tungsten films”, J. Vac. Sci. Technol. A **29**, 051512:1-8 (2011).
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106. B. Wang, D. C. Berry, Y. Chiari, and K. Barmak, “Experimental measurements of heats of formation of Fe₃Pt, FePt and FePt₃ using differential scanning calorimetry”, J. Appl. Phys. **110**, 013903:1-8 (2011).
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105. S. Dillon, L. Helmick, H. M. Miller, C. Johnson, L. Wilson, R. Gemman, R. Petrova, K. Barmak, K. Gerdes, G. S. Rohrer, P. A. Salvador, “The orientation distributions of lines, surfaces, and interfaces around three-phase boundaries in solid oxide fuel cell cathodes”, J. American Ceramic Soc. **94**, 1-7 (2011).
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104. B. Wang, K. Barmak, “Re-evaluation of the impact of ternary additions of Ni and Cu on the A1 to L₁₀ transformation in FePt films”, J. Appl. Phys. **109**, 123916:1-7 (2011).
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103. (*Editor Selection*) K. Barmak, E. Eggeling, M. Emelianenko, Y. Ephshteyn, D. Kinderlehrer, R. Sharp, S. Ta’asan, “Critical events, entropy and the grain boundary character distribution”, Phys. Rev. B **83**, 134117:1-12 (2011).
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102. K. Barmak, E. Eggeling, M. Emelianenko, Y. Ephshteyn, D. Kinderlehrer, R. Sharp, S. Ta’asan, “An entropy based theory of the grain boundary character distribution”, Discrete and Continuous Dynamical Systems A **30**, 427 (2011).
DOI: 10.3934/dcds.2011.30.427
101. B. Wang, K. Barmak, and T. J. Klemmer, “The A1 to L₁₀ transformation in FePt films with ternary alloying additions of Mg, V, Mn and B”, J. Appl. Phys. **109**, 07B739-1:3 (2011).
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100. K. Barmak, “A commentary on: “Reaction kinetics in the processes of nucleation and growth,” by W. A. Johnson, R. F. Mehl, Trans. AIME 35, 416-58 (1939)”, reprinted with the original unpublished appendices now included, Met. Trans. A **41**, 2711-2712 (2010).
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A series of classic articles in metallurgy is being reprinted in Metallurgical Transactions. Each article is preceded by a commentary by an invited scholar who is considered highly knowledgeable in the field.

99. B. Wang, K. Barmak, T. J. Klemmer, "The A1 to L1₀ transformation in FePt films with ternary alloying additions of Ag and Au", IEEE Trans. Magn. **46**, 1773-1776 (2010).
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98. T. Sun, Bo Yao, A. P. Warren, K. Barmak, M. F. Toney, R. E. Peale, and K. R. Coffey, "Surface and grain-boundary scattering in nanometric Cu films", Phys. Rev. B **81**, 155454:1-12 (2010).
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97. B. Yao, T. Sun, A. Warren, H. Heinrich, K. Barmak, K. R. Coffey, "High contrast hollow-cone dark field transmission electron microscopy for nanocrystalline grain size determination", Micron **41**, 177-182 (2010).
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96. K. Barmak, M. Emelianenko, Y. Epshteyn, D. Kinderlehrer, S. Ta'asan, "Geometric growth and character development in large metastable systems", Rendiconti di Matematica, Serie VII, **29**, 65-81(2009).
95. V. I. Dybkov, V. G. Khoruzha, V.R. Sidorko, K. A. Meleshevich, A. V. Samelyuk, D. C. Berry, K. Barmak, "Interfacial interaction of solid cobalt with liquid Pb-free Sn-Bi-In-Zn-Sb soldering alloys", J. Mater. Sci. **44**, 5960-5979 (2009).
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94. T. Sun, B. Yao, A. P. Warren, K. Barmak, M. F. Toney, R. E. Peale, and K. R. Coffey, "Dominant role of grain boundary scattering in the resistivity of nanometric Cu films", Physical Review B **79**, 041402(R):1-3 (2009).
DOI: 10.1103/PhysRevB.79.041402
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PROCEEDINGS AND CONFERENCE RELATED PUBLICATIONS (Peer Reviewed)

67. (*Invited*) Barmak, E. Eggeling, M. Emelianenko, Y. Ephshteyn, D. Kinderlehrer, R. Sharp, S. Ta'asan, "Recent Developments in Material Microstructure: a Theory of Coarsening", Mater. Res. Soc. Symp. Proc **1753**, 2015.
DOI:10.1557/opl.2015.591
66. (*Invited*) K. Barmak, E. Eggeling, M. Emelianenko, Y. Epshteyn, D. Kinderlehrer, R. Sharp, and S. Ta'asan, "Materials microstructure: entropy and curvature driven coarsening", M. Taniguchi, Ed., Research Institute for Mathematical Sciences, University of Kyoto, number 1881, 71-91 (2014).
65. (*Invited*) K. Barmak, E. Eggeling, M. Emelianenko, Y. Epshteyn, D. Kinderlehrer, R. Sharp, and S. Ta'asan, "A Theory and Challenges for Coarsening in Microstructure", Analysis and Numerics of Partial Differential Eqs., Conference in Memory of Enrico Magenes, Franco Brezzi, Piero Colli Franzone, Ugo Gianazza, Gianni Gilardi, Eds., Springer INdAM Series, Milan, Italy (2013).

DOI 10.1007/978-88-470-2592-9

64. K. R. Coffey, K. Barmak, Grain boundary and surface scattering in interconnect metals”, IEEE International Interconnect Technology Conference, 2013.

DOI: 10.1109/IITC.2013.6615565

63. X. Liu, J. T. Nuhfer, J. S. Carpenter, A. Darbal, J. E. Ledonne, S. B. Lee, A. D. Rollett, K. Barmak, “Precession-Assisted Nanoscale Phase and Crystal Orientation Mapping of Cu-Nb Composites in the Transmission Electron Microscope”, *Microscopy and Microanalysis* **18** (Suppl. 2), 1426-1427 (2012).

62. K. Barmak, E. Eggeling, R. Sharp, S. Roberts, T. Shyu, T. Sun, B. Yao, S. Ta’san, D. Kinderlehrer, A. Rollett, K. Coffey, “Grain growth and the puzzle of its stagnation in thin Films: A detailed comparison of experiments and simulations”, *Materials Science Forum*, Trans. Tech. **715-716**, 473-479 (2012).

DOI:10.4028/www.scientific.net/MSF.715-716.473

61. K. Barmak, E. Eggeling, M. Emelianenko, Y. Ephshteyn, D. Kinderlehrer, R. Sharp, S. Ta’asan, “Predictive theory for the grain boundary character distribution”, *Materials Science Forum*, Trans. Tech. **715-716**, 279-285 (2012).

DOI:10.4028/www.scientific.net/MSF.715-716.279

60. A. Darbal, K. J. Ganesh, K. Barmak, G. S. Rohrer, P.J. Ferreira, T. Sun, K. R. Coffey, “Grain boundary characterization of nanocrystalline Cu from the stereological analysis of transmission electron microscope orientation maps”, *Microscopy and Microanalysis* **17** (Suppl. 2), 1426-1427 (2011).

DOI:10.1017/S1431927611008002

59. K. J. Ganesh, A. Darbal, S. Rajasekhara, G. S. Rohrer, K. Barmak, P. J. Ferreira, “Characterizing Texture and Grain Boundaries in Nanoscale Cu Interconnects by Precession Electron Diffraction”, *Proceedings of Microscopy and Microanalysis* **17** (Suppl. 2), 1346-1347 (2011).

DOI:10.1017/S1431927611007604

58. E. F. Rauch, K. Barmak, J. K. Ganesh, P. Ferreira, A. Darbal, D. Choi, T. Sun, B. Yao, K. R. Coffey, and S. Nicolopoulos, “TEM automated orientation and phase mapping for thin film applications”, *Proceedings of Microscopy and Microanalysis* **17** (Suppl. 2), 1086-1087 (2011).

DOI:10.1017/S1431927611006301

57. (Invited) K. Barmak, T. Sun, K. R. Coffey, “Impact of surface and grain boundary scattering on the resistivity of nanometric Cu interconnects”, *AIP Conf. Proc.* **1300**, Eds. E. Zschech, P. S. Ho, S. Ogawa, 12-22 (2010).

DOI: <http://dx.doi.org/10.1063/1.3527118>

56. A. Darbal, K. Barmak, N. T. Nuhfer, T. Sun, K. R. Coffey “Grain size determination and grain boundary characterization of nanocrystalline thin films from conical dark field imaging”,

Proceedings of Microscopy and Microanalysis **15**, Supplement 2, 1232-1233(2010).

55. A. Darbal, K. Barmak, N. T. Nuhfer, D. J. Dingley, G. Meaden, J. Michael, T. Sun, K. R. Coffey, "Orientation Imaging of Nanocrystalline Platinum Films in the TEM", Proceedings of Microscopy and Microanalysis **15**, Supplement 2, 1232-1233(2009).

54. K. Barmak, D. C. Berry, V. G. Khoruzha, V. R. Sidorko, K. A. Meleshevich, A.V. Samelyuk, V. I. Dybkov, "Dissolution kinetics and diffusion of cobalt in Pb-free Sn-Bi-In-Zn-Sb soldering alloys", Proceedings of Materials Science and Technology (MS&T), 262-273 (2008).

53. K. Barmak, M. Emelianenko, D. Golovaty, D. Kinderlehrer, and S. Ta'asan, "On a statistical theory of critical events in microstructural evolution", Proc. of the 11th International Symposium on Continuum Models and Discrete Systems (CMD511), (ENSMP Press, Paris), 185-194 (2008).

52. S. Zhang, Y. Zhang, Y. Rabin, K. Barmak, M. Asheghi, "A novel experimental procedure and technique for small scale calorimetry", Proc. HT2007, ASME-JSME Thermal Engineering Summer Heat Transfer Conference, HT2007, 32894-1:7 (2007).

51. (*Invited*) D. C. Berry, and K. Barmak, "L₁₀ Ordered Intermetallics for ultrahigh density magnetic recording media: phase formation and the role of alloy chemistry and composition", Mater. Res. Soc. Symp. Proc., 0980-II03-05:1-12 (2006).

50. K. Barmak, D. Kinderlehrer, I. Livshits, and S. Ta'asan, "Remarks on a multiscale approach to grain growth in polycrystals", Progress in Nonlinear Differential Equations Applications, Vol. 68, edited by Gianni dal maso, Antonio DeSimone, and Franco Tomarelli (Birkhauser, Basel 2006), pp. 1-11.

49. K. Barmak, W. E. Archibald, J. Kim, C.-S. Kim, A. D. Rollett, G. S. Rohrer, S. Ta'asan, D. Kinderlehrer, "Grain boundary energy and grain growth in highly-textured Al films and foils: Experiment and Simulation", ICOTOM 14, Materials Science Forum **495-497**, 1255-1260 (2005).

48. K. Barmak, D. Kinderlehrer, I. Livshits, and S. Ta'asan, "Remarks on a multiscale approach to grain growth in polycrystals", Proc. of Variational Problems in Materials Science, Trieste (2004).

47. M. Asheghi, Y. Yang, S. Sadeghipour, J. A. Bain, K. Barmak, M. S. Jhon, A. Gellman, E. Schlesinger, J. G. Zhu, and R. M. White, "Nanoscale energy transport in information technology research with an application to high-density data storage devices and systems", Proc. of IMECE Conference.

46. S. Zhang, Y. Yang, K. Barmak, Y. Rabin, Y. and M. Asheghi, "High Resolution Heat Nano-Calorimetry," ASME International Mechanical Engineering Congress & Exposition, IMECE 2004-62105, November 13-19, Anaheim, CA, (2004).

45. (*Invited*) K. Barmak, W. E. Archibald, A. D. Rollett, S. Ta'asan, D. Kinderlehrer, "Grain Boundary Properties and Grain Growth: Al Foils, Al Films", in Interfacial Engineering for

Optimized Properties III, edited by Christopher A. Schuh, Mukul Kumar, C. Barry Carter and Valerie Randle (Mater. Res. Soc. Symp. Proc. Volume 819, Warrendale, PA, 2004), 819-N06-06, 1-12 (2004).

44. A. Gungor, K. Barmak, A. D. Rollett, C. Cabral, Jr., and J. M. E. Harper, "Texture of Cu and dilute binary Cu(Ti) and Cu(In) thin films", Materials Science Forum (Trans. Tech. Publications, Switzerland) **408-412**, 1567-1572 (2002).

43. (*Invited*) K. Barmak, A. Gungor, A. D. Rollett, C. Cabral, Jr., and J. M. E. Harper, "Texture and resistivity of Cu and dilute Cu alloy thin films", Mater. Res. Symp. Proc. **721**, 51-59 (2002).

42. A. Gungor, K. Barmak, A. D. Rollett, C. Cabral, Jr., and J. M. E. Harper, "Cu and dilute binary Cu(Ti), Cu(Sn) and Cu(Al) thin films: texture, grain growth and resistivity", Mater. Res. Symp. Proc. **721**, 60-65 (2002).

41. S. K. Lorachoroensery, W. Z. Misiolek, F. G. Hanejko, K. S. Narasimhan, and K. Barmak, "Magnetic coating on iron powder for improved magnetic performance", Proc. PM Conference, (2000).

40. K. Barmak, G. A. Lucadamo, C. Cabral, Jr., C. Lavoie, and J. M. E. Harper, "Classification of the modes of dissociation in immiscible Cu-alloy thin films", Mat. Res. Symp. Soc. Proc. **564**, 341-346 (1999).

39. J. Kim, K. Barmak, L. H. Lewis, D. C. Crew, and D. O. Welch, "Magnetic exchange coupling in CoPt/Co bilayer thin films", Mater. Res. Symp. Soc. Proc., **577**, 353-358 (1999).

38. R. A. Ristau, K. Barmak, L. H. Lewis, K. R. Coffey, and J. K. Howard, "A study on high coercivity and L_{10} ordered phase in CoPt and FePt thin films", Mater. Res. Symp. Soc. Proc. **577**, 347-352 (1999).

37. G. Lucadamo, K. Barmak, D. T. Carpenter, C. Lavoie, C. Cabral, Jr., C. Michaelson, and J. M. Rickman, "Microstructure evolution during solid-state reactions in polycrystalline Nb/Al and Ti/Al multilayer thin films", Mater. Res. Symp. Soc. Proc. **562**, 159-164 (1999).

36. D. T. Carpenter, M. Watanabe, D. B. Williams, K. Barmak, and David A. Smith, "Measurement of Cu distribution in an Al-4 wt.% Cu thin film by analytical electron microscopy," Boundaries and Interfaces in Materials, Proceedings of The David A. Smith Symposium, Edited by R. C. Pond, W. A. T. Clark, and A. H. King, TMS, 199-204 (1998)

35. D. F. Susan, K. Barmak, A. R. Marder, "Morphological development of electrodeposited Ni-Al particle composite coatings, advances in Coating Technologies of Surface Engineering, eds. C. R. Clayton, J. K. Hirvonen, and A. R. Srivatsa, (TMS, Warrendale, PA) 155-167 (1997).

34. R. A. Ristau, K. Barmak, K. R. Coffey, J. K. Howard, " L_{10} phase formation in CoPt thin films", Mater. Res. Soc. Symp. Proc. **475**, 119-124 (1997).

33. G. Lucadamo, M. Watanabe, K. Barmak, and D. B. Williams, "High resolution x-ray microanalysis of Nb/Al multilayer thin films", Proc. Microscopy and Microanalysis 967-968 (1997).
32. D. T. Carpenter, M. Watanabe, K. Barmak, D. B. Williams, and D. A. Smith, "Quantification of Cu segregation to grain boundaries in an Al - 4 wt.% Cu thin film using high resolution x-ray mapping", Proc. Microscopy and Microanalysis '97, 537-538 (1997).
31. M. Watanabe, D. T. Carpenter, K. Barmak and D. B. Williams, "Quantitative x-ray mapping with high resolution", Proc. European Microscopy Congress, Inst. of Phys. Conf. Series, Series 153, Section 8, 295-298 (1997).
30. K. Barmak, S. W. Banovic, H. M. Chan, L. E. Friedersdorf, M. P. Harmer, A. R. Marder, C. M. Petronis, D. G. Puerta and D. F. Susan, "Processing and Properties of Electrodeposited Functionally Graded Composite Coatings of Ni-Al-Al₂O₃", Proc. of the 4th International Conference on Functionally Graded Materials, FGM '96, Oct. 21-24, Tsukuba, Japan, (Elsevier, Amsterdam 1997) pp. 227-232.
29. K. Barmak, S. W. Banovic, H. M. Chan, L. E. Friedersdorf, M. P. Harmer, A. R. Marder, C. M. Petronis, D. G. Puerta and D. F. Susan, "Electrochemical processing of layered composited coatings of nickel-aluminum-alumina/alumina-zirconia", Mater. Res. Soc. Symp. Proc., **451**, 469-474 (1997).
28. R.A. Ristau and K. Barmak, "Investigation of CoPt and CoPt + ZrO_x thin films for magnetic storage media using high-resolution analytical electron microscopy", Proc. Microscopy and Microanalysis, 1020-1021 (1996).
27. F. Ma, S. Vivekanand, K. Barmak and C. Michaelsen, "Transmission electron microscopy studies of solid state reactions in Nb/Al multilayer thin films", Proc. Microscopy and Microanalysis, 1020-1021 (1996).
26. G. Lucadamo, K. Barmak and C. Michaelsen, "Characterization of reactive phase formation in sputter-deposited Ni/Al multilayer thin films using transmission electron microscopy, Proc. Microscopy and Microanalysis, 1000-1001 (1996).
25. S. W. Banovic, C. M. Petronis, K. Barmak and A. R. Marder, "Graded Ni-alumina coatings via electrodeposition", Proc. of Symp. Elevated Temp. Coating: Science and Technol., Edited by N. B. Dahotre and J. M. Hampikian, TMS 89-98 (1996).
24. (*Invited*) K. Barmak, C. Michaelsen, J. Rickman, M. Dahms, "Reactive phase formation in thin films: evolution of grain structure", Mater. Res. Soc. Symp. Proc., **403**, 51-62 (1996)
23. R. Ristau, K. Barmak, D. Hess, K. R. Coffey, M. A. Parker and J. K. Howard, "Ordering and grain growth in CoPt thin films", Mat. Res. Soc. Symp. Proc. **398**, 557-562 (1996).

22. K. Barmak, S. Vivekanand, F. Ma, C. Michaelsen, "Nucleation and growth of the first phase in sputter-deposited Nb/Al multilayer thin films", Mater. Res. Soc. Symp. Proc. **398**, 257-262 (1996).
21. C. Michaelsen, S. Wöhlert, R. Bormann, K. Barmak, "The early stages of solid state reactions in Ti/Al multilayer films", Mater. Res. Soc. Symp. Proc., **398**, 245-250 (1996).
20. G. Lucadamo, K. Barmak, C. Michaelsen, "Amorphous and crystalline phase formation in Ni/Al multilayer thin films", Mater. Res. Soc. Symp. Proc. **398**, 227-232 (1996).
19. R. A. Ristau, K. Barmak, D. W. Hess, K. R. Coffey, J. K. Howard, "Grain growth kinetics in ordered Co-Pt thin films", Proc. of the 29th annual conf. of the Microbeam Analysis Soc., 415-416 (1995).
18. V. Saikumar, K. Barmak, C. Michaelsen, "A study of reactive phase formation in sputter-deposited Nb-Al multilayer thin films", Proc. of the 29th annual conf. of the Microbeam Analysis Soc., 413-414 (1995).
17. K. Barmak, C. Michaelsen, R. Bormann, G. Lucadamo, "Reactive phase formation in sputter-deposited Ni/Al thin films," Mater. Res. Soc. Symp. Proc. **382**, 33-38 (1995).
16. K. R. Coffey, K. Barmak, "A unified approach to grain boundary diffusion and nucleation in thin film reactions", Mater. Res. Soc. Symp. Proc. **343**, 193-204 (1994).
15. S. M. Lee, K. Barmak, "Amorphous/crystalline structure and phase transformation in metastable semiconducting $\text{Ge}_{1-x}\text{Sn}_x$ ", Mater. Res. Soc. Symp. Proc. **321**, 313-318 (1994).
14. K. Barmak, "The use of TEM and AEM in studying reactions and phase transformations in thin films", Proceedings of the **51st** Annual Meeting of the Microscopy Society of America, 842-843 (1993).
13. (*Invited*) L. A. Clevenger, Q. Z. Hong, R. Mann, J. M. E. Harper, K. Barmak, C. Cabral, Jr., C. Nobili and G. Ottaviani, "Silicide formation in Ti-Si and Co-Si reactions", Mater. Res. Soc. Symp. Proc. **311**, 253-264 (1993).
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11. K. Barmak, K. R. Coffey, "Grain boundary diffusion controlled precipitation as a model for thin film reactions", Mater. Res. Soc. Symp. Proc. **311**, 51-56(1993).
10. L. A. Clevenger, Q. Z. Hong, J. M. E. Harper, C. Cabral, Jr., R. Mann, C. Nobili, G. Ottaviani, K. Barmak, "Silicide formation and transformations in Ti-Si, Co-Si and Ni-Si Reactions, Mater. Res. Soc. Symp. Proc. **311**, 253-258 (1993).

9. E. Ganin, S. Wind, P. Ronsheim, A. Yapsir, K. Barmak, J. Bucchignano, R. Assenza, "TiSi₂ formation on submicron polysilicon lines: role of line width and dopant concentration", Mater. Res. Soc. Symp. Proc. **303**, 109-114 (1993).
8. Q. Z. Hong, K. Barmak, L. A. Clevenger, "Effects of ion implantation on crystallization of amorphous CoSi₂", Mat. Res. Soc. Symp. Proc. **279**, 541-546 (1993).
7. K. Barmak, L. E. Levine, D. A. Smith, Y. Komem, "In situ observation of C49 to C54 TiSi₂ transformation", Proceedings of the **50th** Annual Meeting of the Electron Microscopy Society of America, 1356-1357 (1992).
6. A. Mutscheller, L. A. Clevenger, J. M. E. Harper, C. Cabral Jr., K. Barmak, "Effect of deposition parameters on intrinsic stress, phase transformation and stress relaxation in thin Ta films, Mater. Res. Soc. Symp. Proc. **239**, 51-56 (1992).
5. K. Barmak, L. A. Clevenger, P. D. Agnello, E. Ganin, M. Copel, P. Dehaven, J. Falta, F. M. d'Heurle, C. Cabral Jr., "Effect of an interfacial Ti layer on the formation of CoSi₂ on Si", Mater. Res. Soc. Symp. Proc. **238**, 575-562 (1992).
DOI: <http://dx.doi.org/10.1557/PROC-238-575>
4. K. Barmak, K. R. Coffey, D. A. Rudman, S. Foner, "Effect of microstructure on phase formation in the reaction of Nb/Al multilayer thin films", Mater. Res. Soc. Symp. Proc. **230**, 61-66 (1992).
3. K. R. Coffey, K. Barmak, D. A. Rudman, S. Foner, "First phase formation kinetics in the reaction of Nb/Al, Mater. Res. Soc. Symp. Proc. **230**, 55-60 (1992).
2. K. Barmak, K. R. Coffey, D. A. Rudman, S. Foner, "Characterization of phase formation in multilayer thin films of Nb/Al by cross-sectional transmission electron microscopy", Materials Research Society, Selected Topics in Electronics Materials, 267 (1988).
1. G. Yurek, K. Przybylski, K. Barmak, S. N. Basu, "Oxidation behavior of fine-grained rapidly solidified alloys", Corrosion '88, Paper No. 132, NACE, (1988).

IBM PUBLICATIONS

9. K. Barmak, M. A. Lee, D. J. Schepis, K. Seshan, "An Instrument for Measurement of Pulsed Elements", IBM Technical Disclosure, rated publish.
8. Q. Z. Hong, K. Barmak, F. M. d'Heurle, "Formation of a C49 TiGe₂ phase during annealing a coevaporated Ti_{0.33}Ge_{0.67} alloy", IBM Res. Report RC 18997(82973), (1993).
7. L. A. Clevenger, Q. Z. Hong, R. Mann, J. M. E. Harper, K. Barmak, C. Cabral, Jr., C. Nobili, G. Ottaviani, "TiSi₂ and CoSi₂ reactions for CMOS Applications", IBM Res. Report RC 18915(82599), (1993).

6. L. A. Clevenger, Q. Z. Hong, R. Mann, J. M. E. Harper, K. Barmak, C. Cabral, Jr., C. Nobili, G. Ottaviani, "Silicide formation Ti-Si and Co-Si Reactions", IBM Res. Report RC 18861(82599), (1993).
5. K. Barmak, J. Gambino, "Separation of Gate Salicidation from Source/Drain Salicidation", IBM Technical Disclosure Bulletin **34**, 474 (1992).
4. Q. Z. Hong, K. Barmak, L. Clevenger, "Composition dependence of crystallization of Co-Si alloys", IBM Res. Report RC 17931(78809), (1992).
3. A. Mutscheller, L. A. Clevenger, J. M. E. Harper, C. Cabral, K. Barmak, "Effect of deposition conditions on intrinsic stress, phase transformation, and stress relaxation in tantalum thin films", IBM Research Report RC 17546(77456), (1992).
2. K. Barmak, "Improved Fuses for VLSI Circuits", IBM Technical Disclosure Bulletin **34**, 399 (1991).
1. K. Barmak, R. Bennett, S. Subbanna, A. Yapsir, "Double Poly Improved NTX Transistor Structure", IBM Technical Disclosure Bulletin **34**, 323 (1991).

EXTERNAL ACTIVITIES

38. Meeting Co-Chair, 13th Joint Magnetism and Magnetic Materials and Intermag Conference 2016.
37. Judge, Tricounty Science Fair, April 2014.
36. Program Committee Member, Magnetism and Magnetic Materials Conference 2014 (July 2014).
35. Panel member, NSF SBIR/STTR grants, February 2014.
34. Program Committee Member, Magnetism and Magnetic Materials Conference 2013 (July 2013).
33. IEEE Magnetics Conference Executive Committee, (2013-present).
32. Program Committee Member, Magnetism and Magnetic Materials Conference 2011.
31. Member, IEEE Magnetics Society and the society representative to Women in Engineering (WIE) Committee. The latter is a committee of the IEEE Board of Directors (2011-2013).
30. Session Chair, Magnetism and Magnetic Materials Conference, November 2010.
29. International Materials Reviews Committee (2010-2013)

28. Panel member, NSF CAREER grants, October 2009.
27. Associate Editor, Journal of Electronic Materials (2007-2013).
26. Program Committee Member, Magnetism and Magnetic Materials Conference 2008 (July 2008).
28. Congressional Visit Day – Visiting the Staff of the Offices of Members of the House of Representatives and the Senate”, March 4, 5, 2008.
27. Chair, MO Physics and Devices II, MORIS, Pittsburgh, PA (2007).
26. Program Committee Member, Magnetism and Magnetic Materials Conference 2007 (July 2007).
25. Panel Member, Pre-proposals for Integrated Graduate Education and Research Program, NSF, June 2007.
24. Program Committee Member, 10th Joint Magnetism and Magnetic Materials and Intermag Conference 2007 (August 2006).
23. Member, Graduate Student Award Subcommittee of the Awards Committee, Materials Research Society, 2003-2005.
22. Program Committee Member, 50th Annual Conference on Magnetism and Magnetic Materials 2005.
21. Judge, Graduate Student Award, Materials Research Society, April 2004.
20. Panel Member, NSF-EU grants, January 2004.
19. Panel member, NSF CAREER grants, October 2002.
18. Member, Nominations Committee, Materials Research Society, 2001.
17. Site Review Panel Member, Harvard University National Science Foundation Materials Research Science and Engineering Center (NSF MRSEC), Spring 2001.
16. Meeting Chair, Materials Research Society, Spring 1999.
15. Elected Member of Board of Directors (i.e., Council), Materials Research Society, (1998-2000).
14. Member, Student Affairs Committee, The Minerals, Metals, Materials Society (1998-2000).

13. Judge, Graduate Student Award, Materials Research Society, December 1997.
12. Reviewer, NSF CAREER grants, October 1997.
11. Symposium Organizer, Materials Research Society Symposium M - "Magnetic Ultrathin Films, Multilayers and Surfaces", April 1997.
10. Panel member, NSF instrumentation grants, January 1997.
9. Panel member, NSF CAREER grants, January 1997.
8. Chair, Membership Committee, Materials Research Society (1996-1998).
7. Committee of Visitors, National Science Foundation (NSF), April 1996.
6. Panel member, NSF instrumentation grants, January 1995.
5. Chair, Promotion and Retention Subcommittee of the Membership Committee, Materials Research Society (1994-95).
4. Symposium Organizer, Materials Research Society Symposium H - "Polycrystalline Thin Films: Structure, Texture, Properties and Applications", April 1994.
3. International Advisory Committee member for Functionally Graded Materials (1994-1999)
2. Judge, Lehigh Valley Science and Engineering Fair, March 1994.
1. Reviewer for:

NSF	DoE	CRDF
J. Materials Research	Acta Materialia	J. Appl. Phys.
Metall. Transactions	Applied Physics Letter	Thin Solid Films
J. Mater. Sci.	Mater. Res. Bulletin	J. Vac. Sci. Technol.
J. Physics	Mater. Sci. Eng.	J. Electrochemical Soc.

INVITED TALKS, PROJECT REVIEW PRESENTATIONS (Partial)

- 88." Grain Structure, Grain Boundary Character Distribution and Grain Growth in Thin Metallic Films", University of Utah Math Dept., Salt Lake City, UT, April 2018.
87. "Interconnects Beyond Cu", University of Michigan, Ann Arbor, MI, November 2017.
86. Transmission Electron Microscopy (TEM): A Few Examples of Materials Studies", Lamont Doherty Earth Observatory, November 2017.

85. “Cu and Interconnects Beyond Cu”, Advanced Metallization Conference, Austin, TX, October 2017.
84. “Puzzle of Grain Growth Stagnation in Metallic Films: Simulations and Experiments”, Topics in Applied Non-linear Analysis: Recent Advances and New Trends, Conference in Honor of David Kinderlehrer’s 75th Birthday, Pittsburgh, PA, July 2016.
83. “Grain Growth in Metallic Films: Simulations and Experiments”, SIAM Conference, Philadelphia, PA, May 2016.
82. “Grain Boundary and Surface Scattering of Electrons in Metals for Deeply-Scaled Interconnects”, University of Southern Florida, April 2016.
81. “Grain Growth and the Puzzle of its Stagnation in Metallic Films: Experiment, Simulation and Analytic Theory”, TMS Conference, Orlando, FL, March 15-19, 2015.
80. “Grain Growth and Grain Growth Stagnation in Metallic Films: The Curious Tail of a Tale and an Ear”, The Courant Institute, New York University, November 2014.
79. (*Plenary Lecture*) “Grain Growth and Grain Growth Stagnation in Thin Films: The Curious Tale of a Tail and an Ear”, Continuum Models Discrete Systems, University of Utah, Salt Lake City, UT, July 21-25, 2014.
78. “Grain Boundary and Surface Scattering in Interconnect Metals”, Rensselaer Polytechnic Institute, February 2014.
77. “Grain Boundary and Surface Scattering in Interconnect Metals”, IBM, Albany, October 2013.
76. “Impact of Grain Boundary and Surface Scattering on Resistivity”, Advanced Metallization Conference 2013, College of Nanoscale Science and Engineering, SUNY, Albany, October 2013.
75. (*Plenary Lecture*) “The A1 to L1₀ Transformation in FePt, FeNi and Related Alloys”, International Symposia on Metastable Amorphous and Nanocrystalline Materials (ISMANAM), Turin, Italy, July 2013.
74. L1₀ FePt: Ordering, Anisotropy Constant and their relation to Film Composition, 12th joint Intermag and Magnetism and Magnetic Material Meeting, Chicago, Illinois, January 2013.
73. “Grain Growth and the Puzzle of its Stagnation in Thin Films: Comparison of Experiments and Simulations”, Institute for Pure and Applied Mathematics, University of California, Los Angeles, November 2012.
72. “Surface and Grain Boundary Scattering in Nanometric Cu Films: A Quantitative Analysis Including Twin Boundaries”, Case Western Reserve University, Cleveland, OH, November 2011.

71. "Surface and Grain Boundary Scattering in Nanometric Cu Films: A Quantitative Analysis Including Twin Boundaries", Rutgers University, New Brunswick, NJ, November 2011.
70. "Surface and Grain Boundary Scattering in Nanometric Cu Films: A Quantitative Analysis Including Twin Boundaries", EFRC presentation, Columbia University, NY, November 2011.
70. "Mapping Nanoscale Structures", Dean's Advisory Council, Carnegie Institute of Technology, Carnegie Mellon University, Pittsburgh, PA, April 2011.
69. Quantitative Kinetic Models and Experiments of L1₀ Formation in FePt, CoPt and Related Alloy Films", Information Storage Industry Consortium Meeting, Santa Clara, CA, January 2011.
68. "Classical Resistivity Size Effect: Surface and Grain Boundary Scattering in Cu Thin Films and Lines", Mesoscale Interface Mapping Project Seminar, Pittsburgh, PA, December 2010.
67. Quantitative Kinetic Models and Experiments of L1₀ Formation in FePt, CoPt and Related Alloy Films", Information Storage Industry Consortium Meeting, Milpitas, CA, August 2010.
66. (*Outreach*) Research Experience for Undergraduate Summer Professional Development Series,
65. "Orientation Mapping in the Transmission Electron Microscope", Mesoscale Interface Mapping Project Summer School, Pittsburgh, PA June 2010.
64. Quantitative Kinetic Models and Experiments of L1₀ Formation in FePt, CoPt and Related Alloy Films", Pittsburgh, PA, May 2010.
63. "Thermodynamics and Kinetics of L1₀ Phase Formation in FePt and Related Ternary Alloys", IFW Dresden, Germany, April 2010.
62. "Experimental Studies on Interfacial and Grain Boundary Scattering in Cu, 11th International Workshop on Stress Induced Phenomena in Metallization", Bad Schandau, Germany, April 2010.
61. Quantitative Kinetic Models and Experiments of L1₀ Formation in FePt, CoPt and Related Alloy Films", Information Storage Industry Consortium Meeting, Berkeley, CA, January 2010.
60. "Heat-Assisted Magnetic Recording: The Kinetics and Thermodynamics of L1₀ Formation in FePt and Related Ternary Alloys", David Laughlin Symposium, MS&T Conference, Pittsburgh, October 2009.
59. "Grains, Grain Growth and the Impact of Grain Boundaries on Electrical Resistivity", Columbia University, June 2009.
58. "Lessons from Materials Science: Dominant role of Grain Boundary Scattering in the Resistivity of Encapsulated Cu Films", Physics Colloquium, Carnegie Mellon University, May 2009.

57. "L₁₀ Alloys for HAMR Media: On the Nucleation of the L₁₀ phase", Seagate Research, April 2008.
56. "Grain Growth and the Puzzle of its Stagnation in Thin Films: The Tale of a Tail and an Ear?", California Institute of Technology, March 2008.
55. "L₁₀ Ordered Intermetallics for Ultrahigh Density Magnetic Recording Media: Phase Formation and the Role of Alloy Chemistry and Composition", Materials Research Society Conference, Boston November 2006.
54. "Resistivity of Sub-45 nm Cu Interconnects: Processing, Transport, and Microstructural Characterization – 1292.008", SRC CAIST Back End Workshop, SUNY, Albany, May 2006.
53. "The A1 to L₁₀ transformation in FePt, FeCuPt and FeNiPt", Seagate Research, April 2006.
52. "An Old Problem, A New Approach: Grain Boundary Properties and Grain Growth", University of Central Florida, Orlando, May 2005.
51. "An Old Problem, A New Approach: Grain Boundary Properties and Grain Growth", Boston University, Boston, March 2005.
50. "Microstructural design of polycrystalline materials: nucleation and growth, grain growth" Plasticity Conference, Kauai, January 2005.
49. "Grain boundary properties and grain growth: Al Foils, Al Films", Materials Research Society Conference, San Francisco, April 2004.
48. "Calorimetric studies of the A1 to L₁₀ transformation in FePt and related ternary alloys", Seagate Research, November 2003.
47. "Calorimetric studies of the A1 to L₁₀ phase transformation in FePt and CoPt", Seagate Research, July 2003.
46. "Cu and Cu-alloy thin films: resistivity, texture and grain structure", Interconnect Technology Seminar, IBM T. J. Watson Research Center, July 2003.
45. "Cu and Cu-alloy thin films", IBM T. J. Watson Research Center, April 2003.
44. "Cu and Cu-alloy thin films: resistivity, texture and grain structure", Materials Research Society Conference, San Francisco, April 2003.
43. "Differential scanning calorimetry: thin film reactions and phase transformations", IBM T. J. Watson Research Center, September 2002.
42. "Texture and resistivity of Cu and dilute Cu alloy thin films", Materials Research Society

Conference, San Francisco, April 2002.

41. "Differential scanning calorimetry", Seagate, Minneapolis, February 2002.

40. "Phase transformations in polycrystalline thin films: experiment, theory and simulation", Columbia University, March 2001.

39. "Ordering and grain growth in CoPt and FePt thin films", IBM Almaden Research Center, February 2001.

38. "Magnetic Signature of compositional gradient in exchange spring bilayer thin films of CoPt/Co", Brookhaven National Laboratory, January 2001.

37. "High anisotropy constant materials for magnetic recording media: L₁₀ ordering and grain growth in CoPt and FePt thin films", Data Storage Systems Center, Carnegie Mellon University, September 2000.

36. "Dissociation of dilute copper alloys", IBM T. J. Watson Research Center, August 2000.

35. "Grain growth and ordering in CoPt and FePt thin films", Seagate Technology Lab, Pittsburgh, July 2000.

34. "Experimental and theoretical studies of thin film reactions", Indiana University of Pennsylvania, February 2000.

33. "Thin film reactions", Department of Chemical Engineering, Carnegie Mellon University, October 1999.

32. "Phase Transformations in Thin Metal Films", Naval Research Laboratory, Washington, DC, October 1999.

31. "Phase transformations and mechanical behavior of metal thin films and multilayers", University of Pittsburgh, Department of Mechanical Engineering, October 1999.

30. "Semiconductor Metallization: Phase Transformations in Thin Films", University of Pittsburgh, Department of Materials Science and Engineering, September 1999.

29. "Thin films", Seminar Series, Carnegie Mellon University, September 1999.

28. "Nucleation and growth in thin film reactions: microstructural implications", Rensselaer Polytechnic Institute, March 1999.

27. "Grain structure evolution in thin film reactions", Case Western Reserve University, April 1998.

26. "Evolution of grain structure in thin film reactions", Carnegie Mellon University, March 1998.

25. "Contact metallization and the solid state reaction of thin films", Princeton University, January 1998.
24. "Evolution of grain structure in thin film reactions", Penn State, October 1997.
23. "Role of grain boundaries and interfaces in thin film reactions", Boundaries and Interfaces in Materials: The David A. Smith Memorial Symposium, TMS/ASM Meeting, Indianapolis, IN, Sept. 15,-18, 1997.
22. "Ultrasonic characterization of particles in electrochemical deposition baths," presented at the work shop on Ultrasonic and Dielectric Characterization Techniques for Suspended Particulates, NIST, Gaithersburg, MD, August 4-6, 1997.
21. "Role of interfaces and grain boundaries in thin film reactions", SUNY, Albany, NY, March 1997.
20. "Evolution of grain structure in thin film reactions", Johns Hopkins University, Baltimore, MD, March 1997.
19. "Evolution of grain structure in thin film reactions", II. Fabrication of thermal barrier coatings by electrochemical methods", SUNY, Stony Brook, NY, March 1997.
18. "Evolution of grain structure in thin film reactions, TMS conference, Orlando, Florida, Feb. 10-14, 1996.
17. "Reactive phase formation in thin films: evolution of grain structure," Cambridge University, England, June 1996.
16. "Reactive phase formation in thin films: evolution of grain structure," University of Manchester, England, June 1996.
15. "Reactive phase formation in thin films: evolution of grain structure," Department of Mechanical, Industrial and Manufacturing Engineering, Northeastern University, Boston, MA, May, 1996.
14. "Electrodeposited functionally graded composite coatings", Microscopy of Composite Materials III, Organized by the Royal Microscopical Society, Oxford, England, April 1996.
13. "Tailoring of silicides and aluminides for metallization in microelectronics, ISHM local meeting, Lehigh University, February 1996.
12. "Reactive phase formation in thin films: evolution of grain structure", Fall meeting of the Materials Research Society, Boston, MA, December, 1995.
11. "Metal films and coatings", Sigma Xi luncheon meeting, Lehigh University, November 1994.

10. "Reactive phase formation at interfaces", Department of Chemistry, Lehigh University, November, 1994.
9. "Metal films and coating", Department of Chemistry, Lehigh University, June, 1994.
8. "Solid-state reactions in thin films", Johns Hopkins University, October 1994.
7. "Reactive phase formation at interfaces", University of Konstanz, Germany, August, 1994
6. "Reactive phase formation at interfaces", GKSS Research Center, Geesthacht, Germany, July, 1994.
5. "Metal films and coatings", Lawrence University, Wisconsin, February, 1994.
4. "The use of transmission and analytical electron microscopy in studying reactions and phase transformations in thin films", Microscopy Society of America, August, 1993.
3. "Role of grain boundary diffusion in thin film reactions", AT&T, December, 1992.
2. "Phase formation in the reaction of multilayer thin films of Nb/Al", Stevens Institute of Technology, Department of Materials Science and Engineering, February, 1991.
1. "Phase formation in the reaction of Nb/Al multilayers: a new theory of thin film reaction kinetics", Brookhaven National Laboratory, April, 1991.

CONFERENCE PRESENTATIONS (without an accompanying proceedings' paper)

25. A. P. Warren, B. Yao, T. Sun, K. Barmak, M. F. Toney³, and K. R. Coffey, "X-ray Scattering Study of Interface Evolution and Grain Growth in Encapsulated Cu Films" Materials Research Society Spring Meeting, San Francisco, April 2009.
24. T. Sun, B. Yao, A. P. Warren, D. Choi, K. Barmak, M. F. Toney, R. E. Peale, and K. R. Coffey, "Dominant Role of Grain Boundary Scattering in the Resistivity of Encapsulated Cu Films", Materials Research Society Spring Meeting, San Francisco, April 2009.
23. K. Barmak, A. Darbal, T. Nuhfer, D. J. Dingley, G. Meaden, J. Michael, T. Sun, K. R. Coffey, "Orientation Imaging of Nanocrystalline Copper and Platinum Films in the Transmission Electron Microscope", Materials Research Society Spring Meeting, San Francisco, April 2009.
22. A.D. Rollett, K. Barmak, and B. Radhakrishnan, "Simulation of Interconnect Microstructures", Materials Research Society Spring Meeting, San Francisco, April 2009.

21. K. Barmak, D. C. Berry, J. M. Rickman, "L₁₀ Alloys for Heat Assisted Magnetic Recording (HAMR) Media: On the Nucleation of the L₁₀ Phase in FePt and FeCuPt Alloy Films", Magnetism and Magnetic Materials Conference, Austin, TX, November 2008.
20. K. Barmak, D. C. Berry, B. Wang, "Determination of the Long Range Order Parameter in Fiber-Textured Films of L₁₀ FePt", International Conference on the Texture of Metals, ICOTOM 15, Pittsburgh, PA, June 2008.
19. D. C. Berry, B. Wang, K. Barmak, T. J. Klemmer, "L₁₀ FePt for Ultrahigh Density Magnetic Recording Media: Heats of Formation of the Ordered Intermetallics in the Fe-Pt System", Magnetism and Magnetic Materials, Tampa, FL, November 2007.
18. Heat Assisted Magnetic Recording Media: L₁₀ FePt and the Impact of Ternary Additions of Cu and Ni on the Curie Temperature and the Ordering Transformation", MORIS conference, Pittsburgh, PA, September 2007.
17. K. Barmak, J. Kim, C.-S. Kim, W. E. Archibald, G. Rohrer, A. D. Rollett, S. Ta'asan, D. Kinderlehrer, H. Zhang, D. J. Srolovitz, "Grain boundary energy and grain growth in <111> fiber-textured Al films", MS&T, Pittsburgh, September 2005.
16. K. Barmak, J. Kim, C.-S. Kim, G. S. Rohrer, H. Zhang, D. Srolovitz, "Grain boundary energy as a function of misorientation in <111> fiber-textured Al films: Experiment and simulation", TMS, San Francisco, February 14-18, 2005.
15. K. Barmak, W. E. Archibald, A. D. Rollett, S. Ta'asan, D. Kinderlehrer, "Microstructural design of polycrystalline materials: nucleation and growth, grain growth", Plasticity 2005, Kauai, HI, January 2005.
14. K. Barmak, "Calorimetric studies of the A1 to L₁₀ phase transformation in binary FePt and ternary FeCuPt and FeNiPt thin films", L₁₀ Ordered Intermetallic and Related Phases for Permanent Magnet and Recording Applications, Copper Mountain, CO, August 2004.
13. K. Barmak, J. Kim, D. C. Berry, K. W. Wierman, E. B. Svedberg and J. K. Howard, "Calorimetric Studies of the A1 to L₁₀ Transformation in FePt and Related Ternary Alloy Thin Films", The 9th joint Intermag/MMM conference, Anaheim, CA, January 2004.
12. K. Barmak, J. Kim, L. H. Lewis, K. R. Coffey, M. F. Toney, A. J. Kellock and J.-U. Thiele "Stoichiometry – Anisotropy Connections in Epitaxial L₁₀ FePt(001) Films", The 9th joint Intermag/MMM conference, Anaheim, CA, January 2004.
11. K. Barmak, "Reactive phase formation in thin films: evolution of grain structure", DIFTRANS '98, Cherkasy, Ukraine.
10. C. Michaelsen, G. Lucadamo, K. Barmak, "Sequence of phase formation in the reaction of Ni/Al multilayer thin films", presented at the Materials Research Society Meeting, , Boston, MA, December 1-5,1997.

9. G. Lucadamo, K. Barmak, C. Michaelsen, J. Rickman, S. Tong, J. Codner, "Reactive phase formation and product grain size in Nb/Al multilayer thin films", presented at the Materials Research Society Meeting, Boston, MA, December 1-5, 1997.
8. K. Barmak, "Role of grain boundaries and interfaces in thin film reactions", Boundaries and Interfaces in Materials: The David A. Smith Memorial Symposium, TMS/ASM Meeting, Indianapolis, IN, Sept. 15-18, 1997.
7. K. Barmak, "Ultrasonic characterization of particles in electrochemical deposition baths," presented at the work shop on Ultrasonic and Dielectric Characterization Techniques for Suspended Particulates, NIST, Gaithersburg, MD, August 4-6, 1997.
6. K. Barmak, S. Banovic, H. M. Chan, L. Friedersdorf, M. P. Harmer, A. M. Marder, C. M. Petronis, D. Puerta, D. Susan, "Functionally graded electrodeposited thermal barrier coatings", The Metals, Materials, Minerals Meeting, Orlando, FL, Feb. 10-14, 1997.
5. G. Lucadamo, K. Barmak, C. Michaelsen, "Intermetallic Phase Formation in Nanoscale Ni/Al Multilayers, NIST workshop on nanoscale structural materials, Gaithersburg, MD. August 1995.
4. K. Barmak, C. Petronis, S. Banovic, A. R. Marder, "Fabrication of Functionally Graded Metal-Ceramic Coatings by electrodeposition", American Ceramic Society, Cincinnati, OH, April 1995.
3. K. Barmak, "Mechanisms of grain structure development in the reaction of polycrystalline thin films", presented at the International Symposium on Mechanisms of Formation of Metastable Microstructures, Cambridge, U.K., July 1993.
2. K. Barmak, K. R. Coffey, D. A. Rudman, and S. Foner, "Characterization of intermetallic phase formation in multilayer thin films of Nb/Al by cross-sectional transmission electron microscopy", presented at the Annual Meeting of The Metallurgical Society, Las Vegas, NV, February 1989.
1. K. R. Coffey, K. Barmak, D. A. Rudman, and S. Foner, "Investigation of Nb/Al Diffusion Reactions by Scanning Calorimetry in Thin Film and Powder Metallurgy Processed Samples", presented at the Annual Meeting of The Metallurgical Society, Las Vegas, NV, February 1989.