

October 2009

ANDREW YECKEL

Department of Chemical Engineering & Materials Science, University of Minnesota
421 Washington Avenue SE, Minneapolis, Minnesota 55455-0132, USA
Tel: (612) 722-0379 e-mail: yecke003@umn.edu

Employment

- 1999–Present Senior Research Associate, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, Minnesota
- 9/2007–4/2008 Visiting researcher, Crystal Growth Laboratory, Fraunhofer Institute of Integrated Systems and Device Technology, Erlangen, Germany
- 1995–1999 Research Associate, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, Minnesota
- 1994–1995 Postdoctoral Research Associate, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, Minnesota
- 1992–1993 Consultant, Process Analysts, Inc., Lakewood, Colorado
- 1989–1992 Postdoctoral Research Associate, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, Minnesota

Education

- 1989 Ph.D. Chemical Engineering, University of California, San Diego
Dissertation: *Modeling of Mass Transport in the Growth and Doping of Thin Films by Chemical Vapor Deposition* (advised by Stanley Middleman)
- 1984 B.S. Chemical Engineering, University of California, San Diego

Research Interests

Computer simulation of transport phenomena in materials processing, including bulk crystal growth, chemical vapor deposition, liquid extrusion and coating systems. Algorithm development for computational fluid dynamics, heat, and mass transport using finite element methods, specializing in free and moving boundary problems.

Special Skills

Superb knowledge of computational transport phenomena from problem definition through scientific interpretation, including all aspects of algorithm development. Extensive scientific programming experience under Unix-type operating systems. Working knowledge of C, C++, Fortran 90, and MPI. Proven ability to design and write general-purpose computer codes to perform complicated tasks. Able to take ownership of programming projects midstream.

Awards and Accomplishments

- Fraunhofer Society PROF.X² research scholarship, 2007–2008.
- Research featured on cover of *Crystal Growth & Design*, American Chemical Society, 2001–2003.
- Minnesota Supercomputer Institute Research Scholarships, 1991–1992, 1990–1991.
- Inventor of the “cageboat”, a novel silicon wafer carrier widely used in commercial DRAM fabrication, 1989 (reported in *J. Electrochem. Soc.*, **137**, 207–212, 1990).
- The Graduate Student Award of the Southern California-Nevada Section of The Electrochemical Society, 1987.

Principal Software Development

Cats2D – Crystallization and Transport Simulator 2D (co-developed with R.T. Goodwin)

- General purpose software for solving stationary and time-dependent 2D and 3D-axisymmetric problems with coupled momentum, heat, and mass transport in arbitrary geometries.
- Galerkin-finite element method with arbitrary Lagrangian-Eulerian implementation for rigorous solution of moving boundary problems.
- Arbitrary number of phases, phase change with volume expansion/contraction, latent heat and segregation effects.
- Free surface flows with capillary effects and surfactant transport.
- Generalized Newtonian (Carreau-Yasuda model) and viscoelastic flows (Elastic-Viscous Split-Stress model).
- Linear-elastic solid deformation model for thermal stresses.
- Arbitrary number of chemical species with homogeneous and heterogeneous reaction kinetics.
- Automatic first-order and arclength parameter continuation in any parameter, or in any constrained relationship of multiple parameters.
- Inverse problems subject to arbitrary constraints, model-based process control.
- Mesh generation, solution, and post-processing integrated into single interactive program.

Cats3D – Crystallization and Transport Simulator 3D (co-developed with H. Zhou, Q. Xiao, A.G. Salinger, Y.-I. Kwon, and J.J. Derby)

- Software for solving stationary and time-dependent 3D problems with coupled momentum, heat, and mass transport in arbitrary geometries.
- Galerkin-Least squares finite element method with arbitrary Lagrangian-Eulerian implementation for rigorous solution of moving boundary problems.
- Arbitrary number of phases, phase change with latent heat and segregation effects.
- Portable MPI-based parallel implementation using domain decomposition.

Professional Activities

Guest editor: Proceedings of the Fourteenth American Conference on Crystal Growth and Epitaxy, Seattle, Washington, 2003, *J. Crystal Growth*, Vol. 250; Proceedings of the Third International Workshop on Modeling in Crystal Growth, Stonybrook, New York, 2001, *J. Crystal Growth*, Vol. 230.

Organizing Committee: Sixth International Workshop on Modeling in Crystal Growth, Lake Geneva, Wisconsin, 2009; Third International Workshop on Modeling in Crystal Growth, Stonybrook, 2000.

Consulting: Centre for Thermophysical Researches, Ltd. (2003–2004), Cellresin Technologies (1999), DIGIRAD, Inc. (1996–1997), Creare, Inc. (1996), Process Analysts, Inc. (1990–1991).

Trustee, The Ray Thomas Edwards Foundation, 1997–Present.

Proposal reviewer: National Science Foundation.

Journal reviewer: *J. Crystal Growth*, *AIChE J.*, *Chem. Engng. Science*, *Int. J. Numer. Methods Fluids*, *J. Computational Physics*, *Int. J. Numer. Methods Engng.*, *Physical Review Letters*, *SIAM J. Appl. Math.*, *Int. J. Thermal Sciences*.

Member: American Association for Crystal Growth.

Refereed Articles, Letters, and Chapters

1. S. Middleman and A. Yeckel (1986) "A model of the effects of diffusion and convection on the rate and uniformity of deposition in a CVD reactor," *J. Electrochem. Soc.*, **133**, 1951–1956.
2. A. Yeckel and S. Middleman (1987) "Removal of a viscous film from a rigid plane surface by an impinging liquid jet," *Chem. Eng. Comm.*, **50**, 165–175.
3. A. Yeckel and S. Middleman (1987) "A model of growth rate nonuniformity in the simultaneous deposition and doping of a polycrystalline silicon film by LPCVD," *J. Electrochem. Soc.*, **134**, 1275–1281.
4. A. Yeckel and S. Middleman (1988) "The mathematical modeling of boron diffusion from boron oxide glass film sources," *AIChE J.*, **34**, 1455–1467.
5. A. Yeckel, S. Middleman, and A.K. Hochberg (1989) "The origin of nonuniform growth of LPCVD films from silane gas mixtures," *J. Electrochem. Soc.*, **136**, 2038–2051.
6. A. Yeckel and S. Middleman (1990) "Strategies for the control of deposition uniformity in low-pressure CVD: The design of a novel wafer carrier," *J. Electrochem. Soc.*, **137**, 207–212.
7. A. Yeckel, S. Middleman, and L.A. Klumb (1990) "The removal of thin films from rough surfaces by an impinging liquid jet," *Chem. Eng. Comm.*, **96**, 69–79.
8. A. Yeckel, L. Strong, and S. Middleman (1994) "Viscous film flow in the stagnation region of the jet impinging on planar surface," *AIChE J.*, **40**, 1611–1617.
9. A. Yeckel and L.E. Scriven (1992) "Multiparameter continuation methods for tracking desired flow states," *Supercomputing '92 Proceedings*, 142–151.
10. A. Yeckel, A.G. Salinger, and J.J. Derby (1995) "Theoretical analysis and design considerations for float-zone refinement of electronic grade silicon sheets," *J. Crystal Growth*, **152**, 51–64.
11. J.J. Derby, S. Kuppurao, Q. Xiao, A. Yeckel, and Y. Zhou (1995) "Large-scale numerical modeling of bulk crystal growth from the melt and solution," in: *Science and Technology of Crystal Growth*, Eds. J. P. van der Eerden and O. S. L. Bruinsma, Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 111–122.
12. Q. Xiao, S. Kuppurao, A. Yeckel, and J.J. Derby (1996) "On the effects of ampoule tilting during vertical Bridgman growth: Three-dimensional computations via a massively parallel, finite element method," *J. Crystal Growth*, **167**, 292–304.
13. A. Yeckel, J.W. Smith and J.J. Derby (1997) "Parallel finite element calculation of flow in a three-dimensional lid-driven cavity, using the CM-5 and T3D," *Int. J. Numer. Methods Fluids*, **24**, 1449–1461.
14. A. Yeckel and J.J. Derby (1997) "Numerical experiments in preconditioning with application to incompressible flows in materials processing," *Parallel Computing*, **23**, 1379–1400.
15. A. Yeckel, Y. Zhou, M. Dennis, and J.J. Derby (1998) "Three-dimensional computations of solution hydrodynamics during the growth of potassium dihydrogen phosphate II. Spin down.," *J. Crystal Growth*, **191**, 206–224.
16. A. Yeckel (1998) "Tools for parameter studies in fluid dynamics," *Int. J. Numer. Meths. Fluids*, **28**, 1199–1216.
17. J.J. Derby, K. Edwards, Y.-I. Kwon, J.C. Rojo, B. Vartak, and A. Yeckel (1998) "Large-scale numerical modeling of continuum phenomena in melt and solution crystal growth processes," in: *Theoretical and Technological Aspects of Crystal Growth*, Eds. R. Fornari and C. Paorici, Trans Tech Publications Ltd, Zurich, Switzerland (Material Science Forum, Vol. 276–277, 1998) pp. 119–134.

18. A. Yeckel and J.J. Derby (1999) “On setting a pressure datum when computing incompressible flows,” *Int. J. Numer. Meths. Fluids*, **29**, 19–34.
19. A. Yeckel, F.P. Doty, and J.J. Derby (1999) “Effect of steady crucible rotation on segregation in high-pressure vertical Bridgman growth of cadmium zinc telluride,” *J. Crystal Growth*, **203**, 87–102.
20. J.J. Derby, Y.-I. Kwon, J.C. Rojo, B. Vartak, and A. Yeckel (1999) “Finite element modeling of three-dimensional fluid dynamics in crystal growth systems,” *Int. J. Comput. Fluid Dyn.*, **12**, 225–240.
21. A. Yeckel and J.J. Derby (2000) “Effect of accelerated crucible rotation on melt composition in high-pressure vertical Bridgman growth of cadmium zinc telluride,” *J. Crystal Growth*, **209**, 734–750.
22. B. Vartak, Y.-I. Kwon, A. Yeckel, and J.J. Derby (2000) “An analysis of flow and mass transfer during the solution growth of potassium titanyl phosphate,” *J. Crystal Growth*, **210**, 704–718.
23. J.J. Derby, N. Ponde, V.F. de Almeida, and A. Yeckel (2000) “Modeling segregation and convection during the growth of ternary alloys under terrestrial and microgravity conditions,” in: *Solidification and Gravity 2000*, Eds. A. Roósz, M. Rettenmayr, and D. Watring, Trans Tech Publications Ltd, Zurich, Switzerland (Material Science Forum, Vol. 329–330, 2000) pp. 93–98.
24. A. Yeckel and J.J. Derby (2001) “Buoyant and rotational flows in small-scale vertical Bridgman growth of cadmium zinc telluride using accelerated crucible rotation,” *J. Crystal Growth*, **233**, 599–608.
25. A. Yeckel, A. Pandey, and J.J. Derby (2001) “Representing realistic complexity in numerical models of crystal growth: Coupling of global furnace modeling to three-dimensional flows,” in: *Advances in Computational Heat Transfer II*, Vol. 2, Eds. G. De Vahl Davis and E. Leonardi, Begell House Inc., New York, pp. 1193–1200.
26. J.J. Derby, P. Daoutidis, Y.-I. Kwon, A. Pandey, P. Sonda, B. Vartak, A. Yeckel, M. Hainke, and G. Müller (2002) “High-performance-computing, multi-scale models for crystal growth systems,” in: *High Performance Scientific and Engineering Computing*, M. Breuer, F. Durst, C. Zenger (Eds.), Lecture Notes in Computational Science and Engineering, Springer Verlag, Berlin, pp. 185–200.
27. A. Yeckel (2003) “Comments on Robust iterative methods for solution of transport problems with flow: a block two-level preconditioned Schwarz-domain decomposition method for solution of non-linear viscous flow problems,” *Chem. Eng. Sci.*, **58**, 3295–3297.
28. A. Yeckel and J.J. Derby (2003) “Computational simulations of the growth of crystals from liquids,” in: *Crystal Growth Technology*, Eds. H.J. Scheel and T. Fukuda, John Wiley & Sons, West Sussex, UK, pp. 115–137.
29. P. Sonda, A. Yeckel, P. Daoutidis, and J.J. Derby (2003) “Improved radial segregation via the destabilizing vertical Bridgman configuration,” *J. Crystal Growth*, **260**, 263–276.
30. A. Yeckel and J.J. Derby (2004) “Dynamics of three-dimensional convection in microgravity crystal growth: g-jitter with steady magnetic fields,” *J. Crystal Growth*, **263**, 40–52. (Erratum to this article published in *J. Crystal Growth*, **267**, 751–753.)
31. A. Yeckel, G. Compère, A. Pandey, and J.J. Derby (2004) “Three-dimensional imperfections in a model vertical Bridgman growth system for cadmium zinc telluride,” *J. Crystal Growth*, **263**, 629–644.
32. P. Sonda, A. Yeckel, P. Daoutidis, and J.J. Derby (2004) “Development of model-based control for Bridgman crystal growth,” *J. Crystal Growth*, **266**, 182–189.

33. S.V. Bykova, V.D. Golyshev, M.A. Gonik, V.B. Tsvetovsky, V.I. Deshko, A. Ya. Karvatskii, S. Brandon, O. Weinstein, A. Virozub, J.J. Derby, A. Yeckel, and P. Sonda (2004) “Experimental and numerical analysis of coupled interfacial kinetics and heat transport during the Axial Heat flux close to the Phase interface (AHP) growth of BGO single crystals,” *J. Crystal Growth*, **266**, 246–256.
34. A. Yeckel and J.J. Derby (2004) “Feasibility study of cadmium zinc telluride growth using a submerged heater in a vertical Bridgman system,” *J. Electronic Materials*, **33**, 1–12.
35. J.J. Derby and A. Yeckel (2004) “Modeling of crystal growth processes,” in: *Crystal Growth—From Fundamentals to Technology*, Eds. G. Müller, J.-J. Métois, and P. Rudolph, Elsevier, Amsterdam, pp. 143–167.
36. C.J. Gadgil, A. Yeckel, J.J. Derby, and W.-S. Hu (2004) “A diffusion-reaction model for DNA microarray assays,” *J. Biotechnology*, **114**, 31–45.
37. P. Sonda, A. Yeckel, P. Daoutidis, and J.J. Derby (2005) “Hopf bifurcation and solution multiplicity in a model for destabilized Bridgman crystal growth,” *Chem. Eng. Sci.*, **60**, 1323–1336.
38. A. Yeckel and J.J. Derby (2005) “Computer modelling of bulk crystal growth,” in: *Bulk Crystal Growth of Electronic, Optical and Optoelectronic Materials*, Ed. P. Capper, John Wiley & Sons, West Sussex, UK, pp. 73–119.
39. A. Pandey, A. Yeckel, M. Reed, C. Szeles, M. Hainke, G. Müller, and J.J. Derby (2005) “Analysis of the growth of cadmium zinc telluride in an electrodynamic gradient freeze furnace via a self-consistent, multi-scale numerical model,” *J. Crystal Growth*, **276**, 133–147.
40. P. Sonda, A. Yeckel, J.J. Derby, and P. Daoutidis (2005) “The feedback control of the vertical Bridgman crystal growth process by crucible rotation: Two case studies,” *Computers and Chemical Engineering*, **29**, 887–896.
41. B. Vartak, A. Yeckel, and J.J. Derby (2005) “Time-dependent flow and mass transport during solution growth of potassium titanyl phosphate,” *J. Crystal Growth*, **281**, 391–406.
42. B. Vartak, A. Yeckel, and J.J. Derby (2005) “On the validity of boundary layer analysis for flow and mass transfer caused by rotation during the solution growth of large, single crystals,” *J. Crystal Growth*, **283**, 479–489.
43. L. Lun, A. Yeckel, M. Reed, C. Szeles, P. Daoutidis, and J.J. Derby (2006) “On the effects of furnace gradients on interface shape during the growth of cadmium zinc telluride in EDG furnaces,” *J. Crystal Growth*, **290**, 35–43.
44. L. Lun, A. Yeckel, P. Daoutidis, and J.J. Derby (2006) “Decreasing lateral segregation in cadmium zinc telluride via ampoule tilting during vertical Bridgman method,” *J. Crystal Growth*, **291**, 348–357.
45. A. Yeckel, A. Pandey, and J.J. Derby (2006) “Fixed-point convergence of modular, steady-state heat transfer models coupling multiple scales and phenomena for melt crystal growth,” *Int. J. Numer. Methods Eng.*, **67**, 1768–1789.
46. D. Gasperino, A. Yeckel, B.K. Olmsted, M.D. Ward, and J.J. Derby (2006) “A finite-element analysis of mass transfer limitations during crystal growth measurements in an AFM fluid cell,” *Langmuir*, **22**, 6578–6586.
47. J.J. Derby, L. Lun, and A. Yeckel (2007) “Strategies for the coupling of global and local crystal growth models,” *J. Crystal Growth*, **303**, 114–123.
48. T. Stylianopoulos, A. Yeckel, J.J. Derby, X.-J. Luo, M. Shephard, E. Sander, and V. Barocas (2008) “Permeability calculations in three-dimensional isotropic and oriented fiber networks,” *Physics of Fluids*, **20**, 123601.1–10.

49. C. Stelian, A. Yeckel, and J.J. Derby (2009) “Influence of thermal phenomena on crystal reattachment during dewetted Bridgman growth,” *J. Crystal Growth*, **311**, 2572–2579.
50. A. Yeckel, L. Lun, and J.J. Derby (2009) “An approximate block Newton method for coupled iterations of nonlinear solvers: Theory and conjugate heat transfer applications,” *J. Comput. Phys.*, **228**, 8566–8588.
51. A. Yeckel and J.J. Derby (2009) “Existence, stability, and nonlinear dynamics of detached growth states in vertical Bridgman melt crystal growth,” *J. Crystal Growth*, in preparation.
52. A. Yeckel and J.J. Derby (2009) “Model-based nonlinear feedback controller to stabilize detached growth in vertical Bridgman melt crystal growth,” *J. Crystal Growth*, in preparation.
53. A. Yeckel, J.J. Derby, and E. Aydil (2009) “A model of transport and interfacial phenomena in a nanowire-based, dye-sensitized solar cell,” *J. Electrochem. Soc.*, in preparation.

Proceedings Articles

54. A. Yeckel and S. Middleman (1988) “A model of simultaneous deposition and doping of a silicon film in LPCVD,” *Proceedings of The Electrochemical Society*, Vol. 88-16 (Proceedings of the Symposium on Process Physics and Modeling in Semiconductor Technology, 1986), 218–232.
55. A. Yeckel and L.E. Scriven (1991) “Flow turning and recirculation in slot coating and related coating flows: What are the mechanisms?,” in: *Proceedings of the 44th Annual Conference of the Society for Imaging Science and Technology*, St. Paul, MN.
56. A. Yeckel, Y.-I. Kwon, and J.J. Derby (1997) “Parallel computation of three-dimensional, time-dependent hydrodynamics during solution crystal growth,” *Advances in Computational Engineering Science*, Eds. S. N. Atluri and G. Yagawa, Tech Science Press, Forsyth, Georgia, 794–799.
57. A. Yeckel, Y.-I. Kwon, and J.J. Derby (1997) “Modeling the growth of bulk single crystals via high performance computing,” in: *Proceedings of the 12th Technical Annual Meeting of the Korean Association of Crystal Growth and the 4th Japan–Korea Electronic Materials Growth Symposium*, Seoul, Korea.
58. J.J. Derby, V.F. de Almeida, Y.-I. Kwon, B. Vartak, H. Zhou, and A. Yeckel (1998) “Parallel finite element computations of three-dimensional, incompressible flows in materials processing,” in: *Proceedings of the Fourth Japan-US Symposium on Finite Element Methods in Large-Scale Computational Fluid Dynamics*, Tokyo, Japan.
59. A. Yeckel, V.F. de Almeida, and J.J. Derby (2000) “Theoretical analysis of 3D, transient convection and segregation in microgravity Bridgman crystal growth,” *Space Technology & Applications International Forum*, Ed. M.S. El-Genk, AIP Conference Proceedings, Melville, New York, 884–889.
60. J.J. Derby, Y.-I. Kwon, J.C. Rojo, B. Vartak, and A. Yeckel (2000) “Three-dimensional computations of transport and growth for crystal growth systems”, in: *Proceedings of IMECE 2000*, 2000 International Mechanical Engineering Congress and Exposition, Orlando, Florida.
61. J.J. Derby and A. Yeckel (2000) “Buoyant and rotational flows during ACRT vertical Bridgman crystal growth”, in: *Proceedings of IMECE 2000*, 2000 International Mechanical Engineering Congress and Exposition, Orlando, Florida.
62. A. Yeckel and J.J. Derby (2001) “Suppressing convection in Bridgman crystal growth: Effects of microgravity, magnetic fields, and crucible rotation,” *Proceedings of ICES 2K, International Conference on Computational Engineering Science*, Los Angeles, California.
63. J.J. Derby, A. Pandey, P. Sonda, B. Vartak, A. Yeckel, and P. Daoutidis (2001) “Representing realistic complexity in numerical models of crystal growth: Three-dimensional and time-dependent flows, phase boundaries, and furnaces,” in: *Proceedings of the International FORTWIHR Conference 2001*, Erlangen, Germany.

64. P. Sonda, A. Yeckel, P. Daoutidis, and J.J. Derby (2001) “Complex dynamics within the vertical Bridgman crystal growth process,” in: *Proceedings of the IFAC Symposium: DYCOPS 6*, 6th Symposium on the Dynamics and Control of Process Systems, Cheju Island, Korea.
65. J.J. Derby, B. Vartak, Y.-I. Kwon, A. Pandey, and A. Yeckel (2001) “Multi-scale numerical models of crystal growth systems,” in: *Proceedings of ICES '01, International Conference on Computational Engineering Science*, Puerto Vallarta, Mexico.
66. S.V. Bykova, V.D. Golyshev, M.A. Gonik, V.B. Tsvetovsky, V.I. Deshko, A.J. Karvatskiy, S. Brandon, O. Weinstein, A. Virozub, J.J. Derby, A. Yeckel, and P. Sonda (2002) “Investigation of interfacial kinetics and dynamics of heat and mass transfer in AHP crystal growth of BGO on the basis of solution of 3D and 2D problems”, Abstracts of X Russian Conference on Crystal Growth, Russia, Moscow, IK RAN.
67. P. Sonda, A. Yeckel, J.J. Derby, and P. Daoutidis (2003) “Control of Fluid Flow in the Vertical Bridgman Crystal Growth Process”, Proceedings of the IEEE 11th Mediterranean Conference on Control and Automation: MED '03, Rhodes, Greece.
68. P. Sonda, A. Yeckel, J.J. Derby, and P. Daoutidis (2004) “Suppression of flow oscillations in a vertical Bridgman crystal growth system”, Proceedings of the 2004 American Control Conference, Boston, June 30 - July 2.
69. A. Yeckel and J.J. Derby (2004) “Convective heat and mass transport in novel Bridgman configurations,” in: *Proceedings of ICTAM 2004, The XXI International Congress of Theoretical and Applied Mechanics*, Warsaw, Poland, August 15–21.
70. J.J. Derby, Y.-I. Kwon, A. Pandey, P. Sonda, A. Yeckel, T. Jung, and G. Müller (2006) “Developing Quantitative, Multi-Scale Models For Microgravity Crystal Growth,” in: *Proceedings of Interdisciplinary Transport Phenomena in Microgravity and Space Sciences IV*, Ed. S.S. Sadhal, Tomar, Portugal. August 7–12, 2005. (also to be published in *Ann. N.Y. Acad. Sci.*, in press).
71. J.J. Derby, D. Gasperino, L. Lun and A. Yeckel (2008) “Modeling the growth of CZT by the EDG process,” in *Proceedings SPIE*, Vol. 7079 (Hard X-Ray, Gamma-Ray, and Neutron Detector Physics X), 70790A.1–11.
72. A. Yeckel, C. Stelian, and J.J. Derby (2009) “Heat transfer, capillarity, and phase change during detached Bridgman crystal growth,” EURO THERM Seminar on Thermodynamics of phase changes, May 24–27, Namur, Belgium.

Other Publications

73. A. Yeckel (1995) Numerical solutions to the velocity field through a constriction, appearing in: *Modeling Axisymmetric Flows: Dynamics of Films, Jets, and Drops*, S. Middleman, Academic Press, San Diego, pp. 21–27.
74. V. Prasad, A. Yeckel, and J.J. Derby (2001) Preface to the Proceedings of the Third International Workshop on Modeling in Crystal Growth *J. Crystal Growth* **230**, x–xi.
75. J.J. Derby, G.R. Kowach, R.N. Scripa, and A. Yeckel (2003) Preface to the Proceedings of the Fourteenth American Conference on Crystal Growth and Epitaxy, *J. Crystal Growth* **250**, xiii.
76. A. Yeckel and R.T. Goodwin III (2003) Cats2D (Crystallization and Transport Simulator), User Manual. Unpublished (available at <http://www.msi.umn.edu/~yeckel/cats2d.html>).