

Autumn Fjeld

American Citizen

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RESEARCH AND CAREER FOCUS

Utilization and development of computational fluid dynamics models to solve industrial and scientific engineering problems in the areas of reactive chemistry, separation systems, multiphase systems, solidification and melting, mixing vessels and related transport phenomena.

EDUCATION

University of California, Berkeley – Doctor of Philosophy

Materials Science & Engineering December 2006

Professor James W. Evans

Mathematical Modeling and Experimental Investigations of the Gas Fluxing of Aluminum

University of California, Berkeley – Master of Science

Materials Science & Engineering May 2001

Professor Fiona Doyle

Macromolecular Stabilization of Supported Liquid Membranes

Arizona State University – Bachelor of Science

Chemical Engineering May 1997

Magna Cum Laude

RESEARCH

Post Doctoral Research — University of Leoben, Austria

Simulation & Modeling of Metallurgical Processes June 2006 - Present

- ◊ Working in partnership with Austrian industry, investigating casting processes via computational continuum mechanics modeling, with the primary aim of understanding how filling induced flow phenomena influences final casting.
- ◊ Modeling a horizontal spin casting process to gain understanding of how large body forces and rotation alter solidification behavior.
- ◊ Testing OpenFoam to determine feasibility of implementing a comparable OpenFoam model.
- ◊ Developed FLUENT model to capture key phenomena affecting the casting of a large dual-alloy rolling mill roll, including flow behavior during filling, remelting and solidification; user defined codes written to expand the functionality of the core program.
- ◊ Designed and meshed cad geometries with GAMBIT
- ◊ Defined experimental investigations for our industry partner including cooling curve analysis, metallurgical sampling of the casting, studies of the filling and pouring stream behavior and investigation of process temperatures.
- ◊ Led the project in a forward direction, correlating simulation results and industry observations, providing industrial partner with new insight into their casting process.

PhD — University of California, Berkeley

Materials Science & Engineering June 2001 - June 2006

- ◊ Collaborated in a five year project with Alcoa, Inc. to optimize a molten aluminum purification process, with specific goals to reduce toxic chloride emissions and improve energy efficiency.
- ◊ Developed and evaluated multiple computational fluid dynamics (CFD) models of the aluminum purification process in an industrial stirred tank reactor using FLUENT, simulating two phase flow interactions in an rotary gas injection vessel.
- ◊ Assessed and compared mixing, residence time, and bubble distribution for different operating conditions and impeller configurations in each CFD model.
- ◊ Carried out experimental investigations in an industrial purification unit at the Alcoa Technical Center with a novel bubble detection probe in molten aluminum; used experimental findings to validate and fine tune CFD model results.
- ◊ Employed high speed photography and image analysis to investigate the reduction of particulate emissions in an industrial fluxing unit via laboratory simulation of bubble bursting and droplet splashing at the surface of a molten metal.
- ◊ Utilized a variety of computational and data analysis tools: Femlab, FLUENT, Matlab, Mathematica, GAMBIT.

MS – University of California, Berkeley

Materials Science & Engineering July 1999 - June 2001

- ◊ Researched and developed experimental thin films for supported liquid membranes with an application towards filtration of acetic acid.
- ◊ Investigated processing techniques and properties of epoxy films applied to a membrane surface to seal liquid extractant into pores of supporting membrane.
- ◊ Investigated novel layer-by-layer assembly of polyelectrolytes to be used as thin films encasing extractant in supported liquid membranes.

TECHNICAL EXPERIENCE

Process Engineer - Dow Chemical Corporation, Freeport, TX

Process Engineering Department September 1997 - June 1999

- ◊ Led the Fluid Flow team in serving plant design needs, gathering process information, and applying software design tools.
- ◊ Created equipment database for Process Engineering, providing the department with a single tool to electronically store and communicate information during the design phase of a project.
- ◊ Served on core project team for grass roots chemical plant; designed plant equipment and worked on plant development. Completed air permit calculations for Canadian Government.

Chemical Engineering Intern – Dow Chemical Corporation, Freeport , TX

Department of Epoxy Process Research Summer 1996

- ◊ Developed model to track plant materials and aid in troubleshooting plant material balances.
- ◊ Developed vessel fluid level correlations for material mass accounting and monitoring.
- ◊ Researched possible causes of polymer formation in a heat exchanger.

Summer Intern Flood Control District of Maricopa County – Phoenix, AZ

Environmental Branch Summers 1992 - 1994

- ◊ Assisted in environmental projects for National Pollution Discharge Elimination System Permits.

- ◊ Monitored storm water in Phoenix and checked purity for compliance with EPA standards.
- ◊ Developed a Storm Water Manual to be used by industries in the metro Phoenix area.

TEACHING EXPERIENCE

Teaching Assistant - University of California, Berkeley

Materials Production Fall 2001

- ◊ Prepared weekly homework solutions and assisted students with questions regarding course material during office hours.
- ◊ Prepared occasional lectures and supervised exams throughout the semester.
- ◊ Graded weekly homework assignments and course exams and maintained cumulative records of student scores.

Laboratory Instructor/Lecturer - University of California, Berkeley

Materials Science & Engineering, Introduction to Materials Science Fall 2000

- ◊ Prepared and delivered background lectures on the core concepts related to experiments in the Introduction to Materials Science course. Provided instruction on lab techniques and proper use of lab equipment.
- ◊ Worked closely with students during laboratory, providing individual assistance with problems and questions. Assisted with data analysis and lab reports outside of lab.
- ◊ Received Outstanding Graduate Student Instructor Award, based on end-of-semester student evaluations of the class.

Assistant to Staff & Students - Southbank University, London, England

School of Land Management and Urban Development Summer 1995

- ◊ Provided technical assistance to office staff as they transitioned to a computer based work environment.
- ◊ Assisted students and professors with administrative and academic concerns.

PUBLICATIONS & PROCEEDINGS

A. Fjeld, A. Kharicha, A. Ludwig, "Influence of a Plunging Liquid Jet on a Dual Alloy Casting," The Minerals, Metals, and Materials Society (2010).

A. Fjeld, A. Ludwig, "Einfluss starker Konvektion waehrend des Abfuellens in grossindustriellen Giereiprozessen," Berg- und Huettenmaennische Monatshefte, Vol. 154 No. 11, 504-508 (2009).

A. Fjeld, A. Ludwig, "Influence of Strong Convection in Composite Casting Processes," Proceedings 3rd STEELSIM 2009, Leoben, Austria, (2009).

A. Fjeld, A. Ludwig, "Flow Patterns and Re-melting During the Filling of a Large Composite Casting," International Journal of Cast Metals Research, Vol.22, 111-114 (2009).

A. Fjeld, A. Ludwig, "Modeling and Simulation of a Large Composite Casting," TMS Annual Meeting EPD Congress 2008 Proceedings, Ed. S. M. Howard, The Minerals, Metals, and Materials Society, 281-292 (2008).

A. Fjeld, J.W. Evans, D.C. Chesonis: "Gas Fluxing of Aluminum; Modeling Fluid Dynamics and Magnesium Removal," Light Metals 2008, Ed. D. H. DeYoung, The Minerals, Metals, and Materials Society (2008).

M. Wu, L. Könözy, A. Fjeld, A. Ludwig, "Understanding the Macroseggregation Formation in Steel Ingot Castings: Examples of Multiphase Modeling," Proceeding of the Second International Conference of Simulation and Modelling of Metallurgical Processes in Steelmaking, ASMETS, Graz/Seggau, Austria, 114-119 (2007).

M. Wu, L. Könözy, A. Fjeld, A. Ludwig: "Using a Multiphase Approach to Study the Macrosegregation Formation Mechanisms," 7th Pacific Rim International Conference on Modeling of Casting and Solidification Processes, MCSP2007, Eds. J-Z. Jin, S. Yao, H. Hao, T-M. Wang, 379-387 (2007).

A. Fjeld, J.W. Evans: "Gas Fluxing of Aluminum; Comparison of Computational Fluid Dynamics Models and Experiments," Light Metals 2006, Ed. T.J. Galloway, The Minerals, Metals, and Materials Society (2006).

A. Fjeld, S.S. Edussuriya, J.W. Evans, and A. Mukhopadhyay: "Mathematical Modeling of the Chlorine Fluxing of Aluminum," Light Metals 2005, Ed. H. Kvande, The Minerals, Metals, and Materials Society (2005).

A. Fjeld, J.W. Evans: "Characterization of Droplets Produced by Bubbles Bursting at the Surface of a Liquid Metal," Light Metals 2005, Ed. H. Kvande, The Minerals, Metals, and Materials Society (2005).

A. Fjeld, J.W. Evans, J.W., and D.C. Chesonis: "Laboratory and Full Scale Measurements of Bubble Behavior in Gas Fluxing Units," Light Metals 2004, Ed. A.T. Taberaux, The Minerals, Metals, and Materials Society (2004).

CONFERENCE PRESENTATIONS

Influence of a Plunging Liquid Jet on a Dual Alloy Casting. The Minerals, Metals, and Materials Society Annual Meeting, Seattle, WA, February 2010.

Convection driven Melting during Casting of a dual Alloy Rolling Mill Roll. 6th ASMETS Numerical Simulation of Production Processes, Linz, Austria, October 5, 2009.

Influence of Strong Convection in Composite Casting Processes. 3rd STEELSIM 2009, Leoben, Austria, Sept. 8-10, 2009.

Influence of Strong Convection on Remelting and Species Transport in Composite Casting Processes. The Minerals, Metals, and Materials Society Annual Meeting, San Francisco, CA, February 2009.

Influence of Strong Convection on Remelting and Species Transport in Composite Casting Processes. ANSYS Conference & 26th CADFEM Users Meeting, Darmstadt, Germany, October 2008.

Flow Patterns and Re-melting During the Filling of a Large Composite Casting. ICASP International Conference on Advanced Solidification Processes, Graz/Seggau, Austria, June 2008.

Modeling and Simulation of a Large Composite Casting. The Minerals, Metals, and Materials Society Annual Meeting, New Orleans, LA, March 2008.

Compound Work Rolls: Simulation of a Double-Poured Casting Process. SimSym 2007, Aachen, Germany, June 2007.

Gas Fluxing of Aluminum: Modeling Fluid Dynamics and Magnesium Removal. The Minerals, Metals, and Materials Society Annual Meeting, New Orleans, LA, March 2008.

Gas Fluxing of Aluminum: Comparison of Computational Fluid Dynamics Models and Experiments. The Minerals, Metals, and Materials Society Annual Meeting, San Antonio, TX, March 2006.

Mathematical Modeling of the Chlorine Fluxing of Aluminum. The Minerals, Metals, and Materials Society Annual Meeting, San Francisco, CA, February 2005.

Laboratory and Full Scale Measurements of Bubble Behavior in Gas Fluxing Units. The Minerals, Metals, and Materials Society Annual Meeting, Charlotte, NC, March 2004.

COMPUTATIONAL SOFTWARE EXPERIENCE

- ◊ FLUENT
- ◊ GAMBIT
- ◊ OpenFoam
- ◊ Matlab
- ◊ Mathematica
- ◊ Maple
- ◊ Aspen
- ◊ C, Fortran, Scheme

HONORS/FELLOWSHIPS/GRANTS/NOTABLE

- ◊ Proposal to Materials Center Leoben, a scientific research facility in Austria, accepted for a three year project for simulation of industrial scale horizontal spin casting process
- ◊ Grant written and awarded for computational resources at the Pittsburgh Supercomputing Center
- ◊ Outstanding Graduate Student Instructor Award at Berkeley
- ◊ Recipient of Jane Lewis Fellowships 2001/2002 and 2003/2004 at Berkeley
- ◊ Tau Beta Pi Engineering Honor Society
- ◊ Dow Chemical Outstanding Junior Award
- ◊ Fluent in conversational German