

ISCSST

International Society of Coating Science & Technology

2012



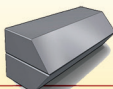
9452 Telephone Road, # 112
Ventura, CA 93004

Who Should Attend:

This Symposium is designed for engineers and scientists who are interested in the fundamental understanding of all aspects of the coating process from liquid application through solidification and final coating microstructure and property development. The Symposium format includes oral and poster presentations as well as networking opportunities. The symposium is well suited to both academic and industrial participants. In past symposia, many different industries, including imaging, electronics, energy, medical/life sciences, metal coil coating, paper, printing, information storage, automobile, textile and chemical, have been represented.



**PREMIER DIES
CORPORATION**



Slot Coating & Plastics Extrusion Die Specialists

Sponsored by:

The International Society of
Coating Science and Technology

Cosponsored by

American Institute of Chemical Engineers

Association of Industrial Metallizers,
Coaters and Laminators

Industrial Partnership for Research in
Interfacial and Materials Engineering
(I PRIME), University of Minnesota

Pressure Sensitive Tape Council (PSTC)

In cooperation with

The European Coating Symposium

The Japan Coating Symposium

Facilitated by

The Tiara Group, Inc.



SONO•TEK Corporation

Northern Pump
Division of McNally Industries, LLC

AIChE®



National Coil Coating
Association

GTI **Converting
Technical
Institute**



ISCSST

International Society of Coating Science & Technology

2012

**16th International Coating Science
and Technology Symposium**

September 9 - 12, 2012

Loews Atlanta Hotel

Midtown Atlanta, Georgia, USA

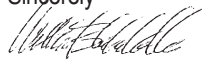
Dear Colleagues,

The ISCST Symposium provides a forum for scientists, engineers and researchers to discuss the latest developments in the application and solidification of thin liquid films. The Symposium features contributions from experts in both academia and industry on topics ranging from fundamental processing science to more applied research and development. The Symposium includes a broad range of coating process science and technology, and impacts many industries. The format is designed to provide mechanisms for the exchange of information and networking across industrial sectors and between academia and industry. The Symposium will be co-located with the TAPPI Advanced Coating Fundamentals Symposium providing attendees with expanded learning and networking opportunities.

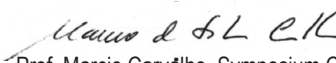
The 2012 Symposium will kick-off with a Plenary Session titled, *What It Takes to Commercialize an Innovation*. Speakers from major corporations, successful startups, government and academia are being invited to present case studies on the commercialization of breakthrough technologies and products. Two special technical sessions will highlight growing arenas for coating processing science. The first special session, *Mechanics of Printing*, will explore the fundamental aspects of web-based (roll-to-roll) printing processes. With continuing excitement in applying printing to non-traditional areas like electronics, and push for limits in printing resolution and uniformity, the need for solid fundamental understanding has never been greater. The second special session, *New and Emerging Coating Process Technologies*, will highlight technologies being developed for the manufacture of new materials that are in the early stages of commercialization.

We hope that you will join us for this exciting and informative event. Please visit our website www.iscst.org for up-to-date information on the program.

Sincerely



Dr. W. Blake Kolb, Symposium Chair
3M Company, St. Paul, MN 55144 USA
(651) 736-4334 • [wbkolb@mmm.com](mailto:wkolb@mmm.com)



Prof. Marcio Carvalho, Symposium Co-Chair
Pontificia Universidade Catolica do Rio de Janeiro
msc@puc-rio.br

Symposium Steering Committee

Michael Joos (*President*)
Andy Hymak (*Vice President for the Americas*)
Hadj Benkreira (*Vice President of Europe*)
Ta-Jo Liu (*Vice President of Asia*)
Bob Fermin (*Secretary*)
Doug Bousfield (*Treasurer*)

Directors:

Brent Bell, W.L.Gore
Aparna Bhave, Boston Scientific
Hadj Benkreira, University of Bradford
Douglas W. Bousfield, University of Maine
Jim Brethour, Flow Science
Marcio Carvalho, PUC-Rio
Ed Cohen, Retired, Dupont

Juan De Santos, Avery Dennison
Ike De Vries, Holst Centre, The Netherlands
Robert Fermon, Avery Dennison
Lorraine Francis, University of Minnesota
Shuzo Fuchigami, Consultant
Alberto Goenaga, NanoH2O
Brian G. Higgins, UC Davis
Andy Hymak, University of Western Ontario, Canada
Alexander Jansen, Avery Dennison
F. Miguel Joos, Corning, Inc.
Hyun Wook Jung, Korea University
Blake Kolb, 3M Company
Satish Kumar, University of Minnesota
Edwin J. Lightfoot, Dupont
James Lim, Corning, Inc.

Ta-Jo Liu, National Tsing Hua University
Dan Mosoiu, Roche Diagnostics
Dan Manning, Capacitec, Inc.
Joan Noyola, 3M Company
Katsuhiro Omori, HIRANO/TECSEED/TEXMAC
Wilhelm Schabel, Karlsruhe University
P. Randall Schunk, Sandia National Labs
Leonard Schwartz, University of Delaware
Martti Toivakka, Abo Akademi University
An-Bang Wang, National Tawian University
Steve Weinstein, Rochester Inst. of Tech.
Mei Wen, Arkema Inc USA
Yukio Yamaguchi, University of Tokyo
Masato Yamamura, Kyushu Inst. of Tech.

John A. Tallmadge Award for Contributions to Coating Technology

This is the preeminent award for engineers and scientists in the international coating community. It recognizes an individual's significant contributions to the understanding or improvement of the technology of the coating of continuous webs. The award is presented biannually, in even numbered years.

Sponsored by: International Society of Coating Science and Technology, and AIChE.

Award: A plaque and \$1,000.

Previous Recipients of the John A. Tallmadge Award

1992 L. E. Scriven, Dept. of Chemical Engineering, Univ. of Minnesota
1994 E. B. Gutoff, Consultant
1996 J. E. Hens, retired, AGFA
1998 Kenneth J. Ruschak, Eastman Kodak Co., Rochester, NY
2000 Edward D. Cohen, retired, DuPont Fellow
2002 Terrence D. Blake, Kodak Ltd., Harrow, Middlesex, UK
2004 Brian G. Higgins, University of California, Davis
2006 Peter M. Schweizer, Polytype Converting, Switzerland
2008 Ta-jo Liu, National Tsing Hua University, Taiwan
2010 Ramon L. Cerro, University of Alabama, Huntsville, AL

L.E. Scriven Young Investigator Award

This award is given in recognition of outstanding sustained achievements or one-time breakthroughs in the area of continuous liquid film coating science and technology. Those nominated for this award must be 40 years old or younger. The award will be presented at the Symposium.

Sponsored by: International Society of Coating Science and Technology
Award: A plaque and \$500.

Past Recipients of the Young Investigator Award

1998 Cyrus Aidun, Institute of Paper Chemistry, Georgia Institute of Technology-Atlanta
Dennis Coyle, General Electric Company, Niskayuna, NY
2000 Steven J. Weinstein, Eastman Kodak Co., Rochester, NY
2002 Andrew Clarke, Kodak Ltd., Harrow, Middlesex, UK
W. Blake Kolb, 3M Company, St. Paul, Minnesota
2004 Marcio D. Carvalho, Pontificia Universidade Catolica do Rio de Janeiro, Brazil
2006 Richard A. Cairncross, Drexel University, Philadelphia, PA
2008 Wilhelm Schabel, Karlsruhe University, Karlsruhe, Germany
2010 Satish Kumar, University of Minnesota, Twin Cities, MN
H. Pirouz Kavehpour, University of California, Los Angeles, CA

Web Handling Fundamentals

September 8, 2012 - Course Fee \$795

Minimum registration to hold course: 20

Fee includes lectures, course materials, lunch, refreshments and snacks during breaks. The course fee does not include the Symposium registration.

Purpose

Web handling is a process engineering discipline focusing on improving productivity and reducing waste of product made from papers, films, foils, nonwovens, textiles, or any thin, continuous material.

Many manufacturing trends create new challenges for web handling and winding, including thinner, wider, or more delicate products, faster or more integrated processes, and ultra-clean or hazardous environments – all increasing the potential for web handling defects. Learning to handle these materials, processes, and environmental challenges will provide your company with a competitive advantage.

Intended Audience

If you have web handling-related waste, including breaks, wrinkling, scratching, or roll defects, this workshop should easily pay for itself. No matter what web converting process you run, creating \$1000s of web handling waste doesn't take long. We will teach you the causes of web handling defects and how to eliminate them.

If you are shopping for new web handling equipment, this workshop will review the design options available in tension control, guiding, rollers, and winders, reviewing the mechanics and best practices of each.

This workshop is directed towards technical employees of any level with a need to understand the fundamentals of web handling. Though the seminar will include some engineering theory and equations, the workshop's goal is to show how theory and experiment lead to practical solutions to common problems.

Materials

Each course attendee will receive a binder containing copies of the slides as well as a reference list for each topic area.

Program

Web mechanical properties

Tension control

Roller design

Web-roller traction / lubrication

Nipped roller systems

Web guiding/ tracking

Wrinkling / spreading

Winding and roll quality

About the Instructor

Timothy J. Walker — TJWalker + Associates Inc.

Mr. Walker is President of TJWalker & Associates and has worked as an independent web handling consulting engineer since 1999. Tim is an internationally recognized leader in web handling and has worked with over 100 companies in a variety of industries. Tim worked for 3M Co. for seventeen years, working first in polyester film manufacturing before joining the corporate web handling process development lab. While at 3M, Tim served as representative to the Oklahoma State University Web Handling Research Center (OSU WHRC) and as Corporate Web Handling Technology Leader. Tim writes a monthly column, Web Lines, for Paper, Film, and Foil Converter magazine and has taught web handling to over 4000 students. Tim has a BS in Mechanical Engineering from the University of Iowa and a MS in Management of Technology from the University of Minnesota. From his years in process development and technical training, Tim is quick to diagnose problems and explain the solution options based on experience and his understanding of mechanics of web handling. tjwalker@tjwa.com / www.webhandling.com

Precision Coating and Solidification

September 9, 2012 - Course Fee \$895

Minimum registration to hold course: 20

Fee includes lectures, course materials, lunch, refreshments and snacks during breaks. The course fee does not include the Symposium registration.

Purpose

This course covers the fundamentals of precision coating and solidification. The lectures are a subset and condensation of some of those presented at the three day intensive short course on Coating Process Fundamentals that is held annually at the University of Minnesota. This one day course is focused on premetered coating, multilayer coating and solidification phenomena.

Intended Audience

The course is designed for coating engineers and scientists dealing with precision coating processes.

Materials

Each course attendee will receive a binder containing copies of the slides as well as a reference list for each topic area.

Program

Introduction (Marcio Carvalho)

Liquid coating properties (Marcio Carvalho)

Basics of air entrainment (Satish Kumar)

Slot coating (Marcio Carvalho)

Tensioned web over slot coating (Marcio Carvalho)

Visualization (Wieslaw Suszynski)

Precision multilayer coating (Marcio Carvalho)

Drying and microstructure (Lorraine Francis)

Stress and Defects (Lorraine Francis)

About the Instructors

Professor Marcio Carvalho

Marcio is a Professor in the Department of Mechanical Engineering at Pontificia Universidade Catolica do Rio de Janeiro, in Brazil and a member of the Graduate Faculty in the Department of Chemical Engineering & Materials Science at the University of Minnesota. Marcio has been active in coating research and development for more than 20 years. He received his PhD in Chemical Engineering from the University of Minnesota in 1995, with a thesis on the basic mechanisms, experiments, theory and computer aided analysis of roll coating processes that make use of deformable rolls. He worked as Senior Process Development Engineer at 3M Company and Imation Corporation in the areas of pre-metered coating, roll coating and drying technologies. Marcio's research interests several aspects of the coating process, non-Newtonian fluid mechanics and micro scale flow of emulsions. Marcio received the L. E. Scriven Young Investigator Award from ISCST in 2004 and the State of Rio de Janeiro Investigator Award in 2010.

Professor Lorraine F. Francis

Lorraine is a Professor in the Department of Chemical Engineering and Materials Science at the University of Minnesota and Program Co-Leader of the Coating Process Fundamentals Program of IPRIME (Industrial Partnership for Research in Interfacial and Materials Engineering) at the University of Minnesota. Lorraine received her PhD in Ceramic Engineering from the University of Illinois in 1990 on research related to ceramic sol-gel coatings for dielectric applications. She has been at the University of Minnesota for 21 years. Lorraine's research interests include drying, microstructure development, ceramic-polymer composites, stress development and particulate coatings. She has received several awards and honors. In 2008, she was named a Taylor Distinguished Professor at the University of Minnesota.

Professor Satish Kumar

Satish Kumar is a Professor in the Department of Chemical Engineering and Materials Science at the University of Minnesota. Prof. Kumar received his undergraduate degree from Minnesota (1993), and his master's (1994) and doctoral degrees (1998) from Stanford University, all in chemical engineering. Following postdoctoral work at Ecole Normale Supérieure (Paris) and the University of Michigan, he joined the faculty at Minnesota in 2001. Prof. Kumar currently serves as co-leader of the Coating Process Fundamentals Program and as Director of Undergraduate Studies for Chemical Engineering at Minnesota. In 2010, He received the L. E. Scriven Young Investigator Award from the International Society of Coating Science and Technology. Prof. Kumar's research program is centered around the investigation of fundamental problems in transport and interfacial phenomena, many of which are motivated by industrial applications such as printing and coating, polymer processing, and nano/micro-fluidics.

Wieslaw J. Suszynski

Wieslaw is a Research Fellow and manages the Coating Process and Visualization Laboratory at the University of Minnesota. He is responsible for the design and operation of the experimental coating equipment and associated instrumentation as well as scientific visualization, photography, standard and high-speed video imaging. Wieslaw has participated in the development of coating and drying visualization technology in the Coating Process Fundamentals Program for more than 20 years and has collaborated with industry extensively. Wieslaw graduated from the Cracow University of Technology, Poland, where he received his MSChE degree.

Tabletop Exhibits

This Symposium is expected to attract 200-300 engineers and scientists from the world's leading manufacturers of coated products and academic programs in coating science. It is an ideal opportunity for companies to reach individuals who improve and scale-up new coating processes, new coated products and those who are likely to do so in the future.

Companies offering products or services that may be of interest to the attendees are encouraged to participate at this Symposium. In past Symposia exhibitors have included representatives from companies offering specialized mixers, dies, coating applicators and other coating, drying, and curing equipment; companies offering coating services (toll coaters); companies offering software that predict coating flows and film drying; and companies offering instrumentation useful in the coating and drying processes.

The Exhibit Hall will be open each day of the Symposium and will be located in the area where all scheduled breaks are held. The fee for exhibiting is \$995, which includes one registration fee. Your display will be a true tabletop exhibit in which all materials must fit safely on a 6 foot skirted table.

For further information please contact
Mr. Terry Gorka, The Tiara Group, Inc.
tgorka@thetiargroup.com
805-340-0608 • Fax: 805-323-5074

Plenary Session

What it Takes to Commercialize an Innovation

The 2012 Symposium will kick off with a ISCST/TAPPI ACFS Plenary Session titled, What It Takes to Commercialize an Innovation. Speakers from major corporations, successful startups, government and academia will present case studies on commercialization of breakthrough technologies and products. The final Plenary Session program can be found on the ISCST website in the coming weeks.

Technical Sessions

Coatings Fundamentals

A hallmark of the ISCST meeting is this session on the application of engineering and science fundamentals to improve the understanding of coating applications. Presentations are encouraged on topics of a fundamental, experimental, numerical or analytical nature that are related to liquid flows and rheology, defects and stability, air entrainment, wetting, and other application related issues.

Coating Application Processes

This session focuses on the engineering and science of coating application methods, either conventional or novel. Presentations cover a range of topics, from improved die design to extending the limits of coating speeds and thickness.

Solidification and Microstructure Development

Coatings are solidified and coating microstructures are established by a variety of processes, including drying, curing, coalescence (film formation), phase separation, and gelation. Presentations on the fundamentals of these processes and related topics such as microstructure-property relationships, stresses and defects, particle microstructures, and coating adhesion are encouraged.

Nanomaterials and Nanoscale Coatings

This session features processing challenges and opportunities in the use of nanomaterials in coatings and nanoscale features in coatings, such as ultrathin coatings and nanoscale patterns. Possible presentation topics include nanoparticle-based coatings, nanocomposites, layer-by-layer self assembly, microcontact printing, convective assembly, and thickness control at the nanometer level.

Flow and Drying of Particulate Coatings

Particulate coatings present interesting challenges for liquid coating flows and application, and for drying and microstructure development. In this session, presentations address all aspects of the particulate coating process.

Wetting

Wetting is an essential step in the coating process and may limit the coating speed. In this session, presentations cover issues related to the dynamics of wetting and air entrainment as well as substrate or surface phenomena that influence wetting.

ISCST/TAPPI ACFS Special Technical Sessions

New and Emerging Technologies

There is an increasing demand for new technologies to enable revolutionary new products and to improve performance and manufacturing of existing ones. This session will also highlight technologies being developed that are in the early stages commercialization.

Mechanics of Printing

This session will explore the fundamental aspects of web-based (roll-to-roll) printing processes. Studies, both modeling and experimental, of mechanical deformations, fluid mechanics, elasto-hydrodynamics, drying, diffusion, and other relevant physics of gravure, flexographic, screen, lithographic, and micro-contact printing processes are of interest. With continuing excitement in applying printing to non-traditional areas like electronics, and push for limits in printing resolution and uniformity, the need for solid fundamental understanding has never been greater.

Poster Sessions

Another hallmark of the ISCST symposium, the poster session provides an excellent forum to communicate your latest research and technologies. This year's session is well represented by authors from both industry and academia.

Networking Session

The Networking Session is a forum for people interested in showcasing areas of interest in which collaboration is actively being sought. This collaboration may take the form of direct industrial support, joint research proposals, internships, etc. As such, the session's presentations are intended to be far less formal and not expected to be as fully developed as presentations at the technical sessions.

Golf Tournament (Sunday, 8:00 AM), Wolf Creek Golf Club, meet in the lobby at 7am, best ball, \$75

Networking Session (Sunday, 4:00 PM)

At this year's Networking Session ISCST will welcome individuals from a number of leading companies seeking future employees. Each of these representatives will deliver a brief, informative talk on their company, its operations, benefits and career paths. Following those talks, attendees will have a chance to meet with each representative to discuss career goals and future employment opportunities. Refreshments are included during this Session.

Welcome Reception (Sunday evening, 6:00 PM) The opening reception will be held at the Loews Rooftop Courtyard. ISCST and TAPPI ACFS attendees will enjoy food and socializing.

September 10, Monday AM

ISCST/TAPPI ACFS Plenary Session: What it Takes to Commercialize an Innovation

co-chairs: Ramon Cerro, University of Alabama, Huntsville
E. Ted Lightfoot, Dupont

12:00 AM **ISCST/TAPPI ACFS Luncheon, Tallmadge and Scriven Awards**

September 10, Monday PM Parallel

Technical Session 1: Coating Fundamentals

co-chairs: Andy Hrymak, University of Western Ontario
Kenneth Rushak, Rochester Institute of Technology

1:30 PM **A Mathematical Model for Three-dimensional Coating Flow with Thixotropy**

L. W. Schwartz and R. R. Eley
University of Delaware and Glidden Paints

1:50 PM **Capillary Flows**

I. de Vries, J. Gabel and R. van Kasteren
Holst Centre/TNO

2:10 PM **Electrohydrodynamic Effects in the Leveling of Coatings**

A. Ramkrishnan and S. Kumar
University of Minnesota

2:30 PM **Withdrawal of a Cylinder from an Ellis Fluid**

A.N. Hrymak, M. Javidi and M. Pope
University of Western Ontario and Princeton University

2:50 PM Break

3:10 PM **Response of Two-layer Slot Coating Flows to Periodic External Disturbances**

D. Maza and M. S. Carvalho
PUC-Rio

3:30 PM **Flow Separation at a Free Surface: Scenarios that Promote Liquid Jetting**

A. Goenaga and B. Higgins
University of California, Davis

3:50 PM **Prediction of Roll Coating with Counter-rotating Deformable Rolls by Analytical Methods**

B. Willinger and A. Delgado
Friedrich-Alexander University Erlangen-Nueremberg

4:10 PM **Misting in Forward Roll Operation Compared to a Filament Stretching Model**

A. Sienkiewicz and D. W. Bousfield
University of Maine

4:30 PM **The Misting Phenomena in Roll Coating: Experiments and CFD Simulations**

S. Sarma, H. Benkreira, E. van Vliet, M. Klaassen and S. Bohm
University of Bradford and Tata Steel RD&T

4:50 - 6:30 PM **Poster Session**

September 10, Monday PM Parallel

Technical Session 2: Solidification and Microstructure Development

co-chairs: Lorraine Francis, University of Minnesota
Yukio Yamaguchi, University of Tokyo

1:30 PM **CryoSEM Investigation of Freezing and Thawing of Latex Paintings**

M. Mittal, J. Roper III, C. Jackson, G. Monaghan and L. Francis
University of Minnesota and Dow Chemical Company

1:50 PM **Visualization Study of the Binder Distribution in Electrode during Drying**

H. Hagiwara, L. Francis and W. Suszynski
Toyota Motor and University of Minnesota

2:10 PM **Comparison of Integral and Local Drying Behavior of Thin Organic Films on Flat Plates**

M. Baunach, S. Baesch, W. Schabel and P. Scharfer
Karlsruhe Institute of Technology

2:30 PM **The Effect of Solidification on Entrained Air Bubbles in a Polymer Membrane**

Z. Y. Ahmad and T. A. L. Harris
Georgia Institute of Technology

2:50 PM Break

3:10 PM **Water Absorption in Polymer Mixtures - Phase Equilibrium and Diffusion Kinetics**

S. Kachel, P. Scharfer and W. Schabel
Karlsruhe Institute of Technology

3:30 PM **Transitions Between Suppressed and Enhanced Drying Modes in Phase-separating Coatings**

M. Yamamura, T. Nasu, S. Harada, Y. Mawatari and H. Kage
Kyushu Institute of Technology

3:50 PM **Experimental and Numerical Investigation of Multi-solvent Mass Transport during Thin Film Drying**

D. Siebel, W. Schabel and P. Scharfer
Karlsruhe Institute of Technology

4:10 PM **Effect of Coating and Drying Process on the Optical Properties of Pi-conjugated Polymers**

M. Yamaguchi, Y. Tsuji and Y. Yamaguchi
University of Tokyo

4:30 PM **Investigation of Surface Deformation due to Surface Tension Driven Flows**

P. Cavadini, J. Krenn, P. Scharfer and W. Schabel
Karlsruhe Institute of Technology

4:50 - 6:30 PM **Poster Session**

September 11, Tuesday AM Parallel

ISCST/TAPPI ACFS Special Technical Session 1: New and Emerging Technologies

co-chairs: Randy Schunk, Sandia National Lab/University of New Mexico
Alberto Goenaga, NanoH2O

8:15 AM **Nanostructure Thin Films via Layer-by-Layer Assembly at the Industrial Scale**

K. Rieken and B. Wang
Svaya Technologies

8:35 AM **Advantages of TCO via Ultrasonic Spray Under Atmospheric Conditions**

R. Engle and M. Dart
Sono-Tek Corporation

8:55 AM **Photonic Curing used for RFID and Silicon Processing**

S. Farnsworth, K. Schroder, B. Wenz, D. Pope and I. Rawson
Novacentix

9:15 AM **UV LED Curing for Coatings and Adhesives: Advancements and Benefits**

R. Anand
Phoseon Technology

9:35 AM Break

10:05 AM **Spray-coating of Functional Layers of OLED and OPV**

J. Gabel, P. Rensing
Holst Centre/TNO

10:25 AM **Trends in Printed Intelligence**

T. Erho
VTT Technical Research Centre of Finland

10:45 AM **Advancement of Coated Non-woven Glass Mats for High- Performance Building Materials**

H. Teng, B. Hammond and B. Johnson
Owens Corning

11:05 AM **New Capacitance Electronics Technology for Maintaining Slot Die Coater Gap Uniformity in the Lab and Production**

B. Manning and R. Foster
Capacitec, Inc.

11:25 AM **High Definition Defect Detection and Monitoring of Coated Materials**
J. Koenig
Schenk Vision

11:45 AM ISCST/TAPPI ACFS Lunch

September 11, Tuesday AM Parallel

ISCST/TAPPI ACFS Special Technical Session 2: Mechanics of Printing

co-chairs: **Mikhail Pekurovsky, 3M Company**
Satish Kumar, University of Minnesota

8:15 AM **Thin-Film Models of Liquid Displacement on Chemically Patterned Surfaces for Lithographic Printing Processes**
S. K. Kalpathy, L. F. Francis, and S. Kumar
University of Minnesota

8:35 AM **Dewetting Flow by Inter-Surface Force during Hydrophobic Patterning**
K. Miyamoto
Fuji Film Corporation

8:55 AM **Controlled Destabilization of Liquid Coatings on Partially Wetting Substrates using Laminar Air-jets**
C. W. J. Berendsen, J. C. H. Zeegers, G. C. F. L. Kruis, M. Riepen and A. A. Darhuber
Eindhoven University of Technology

9:15 AM **Short Time Spreading and Wetting of Offset Printing Liquids on Model Calcium Carbonate Coating Structures**
H. Koivula, M. Toivakka and P. Gane
Abo Akademi University, Alto University and Omya Development AG

9:35 AM Break

10:05 AM **Web Tension Formation and Web Deformation in Printing Process**
M. Parola, J. Sorvari and J. Ketoja
VTT Technical Research Centre of Finland

10:25 AM **Motion and Arrest Shape of Liquid on Cold Solid Targets**
F. Tavakoli and H. P. Kavehpour
University of California, Los Angeles

10:45 AM **The Dynamics of Three-Dimensional Liquid Bridges with Pinned and Moving Contact Lines**
S. Dodds, M.S. Carvalho and S. Kumar
University of Minnesota and PUC-Rio

11:05 AM **Liquid Transfer in Gravure Printing Processes: A New Numerical Approach to Study the Effect of Cavity Shape**
D. Campana and M. S. Carvalho
PUC-Rio

11:25 AM **Reduced-order Modeling Techniques for Understanding Printing and Coating**
S. A. Roberts, K. Tjiptowidjojo and P. R. Schunk
Sandia National Lab and University of New Mexico

11:45 AM ISCST/TAPPI ACFS Lunch

1:15 - 2:15 PM **Poster Session**

September 11, Tuesday PM Parallel

Technical Session 3: Coating Application Processes

co-chairs: **Ta-jo Liu, National Tsing Hua University, Taiwan**
Peter Schweizer, Polytype Converting AG

2:15 PM **Improved Model for the Secondary Cavity of a Coating Die**
M. Livelli, K. Ruschak and S. Weinstein
Rochester Institute of Technology

2:35 PM **Improving Die Designs**
W. Leonard and J. Louks
Private Consultants

2:55 PM **Visualization Study of Liquid Surface Stability for Full Reverse Roll Coater with Rigid Gravure Roll**
H. Kobayashi
JFE Steel Corporation

3:15 PM **High Speed, Very Thin Films with Reverse Roll Coating at Near Zero and Negative Gaps**
Y. Shibata, H. Benkreira and K. Ito
Toyobo Co. Ltd. and University of Bradford

3:35 PM Break

3:55 PM **Composite Gas Barrier Film with a Liquid Inner Layer**
C-C. Liu and T-J. Liu
National Tsing Hua University, Taiwan

4:15 PM **Development of Solution Processed Multilayer Oleds**

K. Peters, P. Scharfer and W. Schabel
Karlsruhe Institute of Technology

4:35 PM **Ultra Thin Coating with Tensioned-web Method and Defect Analysis by Real-time Thickness Measurement Method**
T. Horii and M. S. Carvalho
University of Minnesota and Pontificia Universidade Católica do Rio de Janeiro

4:55 PM **Simulations and Experiments for Flow Behavior and Operability Window in Slot Coating**
S. H. Lee, J. W. Nam, S. J. Kim and H. W. Jung
Korea University, Sungkyunkwan University, Andong National University

5:15 PM **Pushing the Limits of Slot Coating with the Application of Low Viscosity Gases at Low Pressure**
H. Benkreira and J.B. Ikin
University of Bradford

September 11, Tuesday PM Parallel

Technical Session 4: Nanomaterials and Nanoscale Coatings

co-chairs: **Bob Fermin, Avery Dennison**
Martti Toivakka, Abo Akademi University

2:15 PM **Convective Assembly for Nanostructured Optical and Biofunctional Coatings**
A. Welden, T. Muangnapoh, P. Kummorkaew and J. Gilchrist
Lehigh University

2:35 PM **Ultrathin Coatings of Exfoliated Zeolite Nanosheets on Porous and Non-Porous Supports**
K. Varoon, L. F. Francis and M. Tsapatsis
University of Minnesota

2:55 PM **Nanostructure and Electrical Properties of Organic Semiconductor Thin Films Prepared by Wet and Dry Processing**
Y. Tsuji and Y. Yamaguchi
The University of Tokyo

3:15 PM **Active Control of Evaporative Solution Deposition by Modulated Infrared Illumination**
J. A. Vieyra, J. M. van der Veen, J. J. Michels and A. A. Darhuber
Eindhoven University of Technology, Dutch Polymer Institute and Holst Centre/TNO

3:35 PM Break

3:55 PM **Improving Surface Properties by Laser based Drying, Gelation and Densification of Printed Sol-Gel Coatings**
D. Hawelka, J. Stollenwerk, N. Pirsch and K. Wissenbach
Fraunhofer Institute for Laser Technology and RWTH Aachen University

4:15 PM **Active Corrosion Protection Ability of Hydrothermally Treated TiO₂ Sol-Gel Film Loaded with Corrosion Inhibitors**
J. H. Park, K. Y. Kim and J. M. Park
Pohang University of Science and Technology (POSTECH)

4:35 PM **Photocatalytic Sol - Gel TiO₂ Films on Steel Substrate: Effects of Surface Treatment and Heat Treatment of Coated Steel Substrate on their Photo Catalytic Activity**
W. S. Kim, K. Y. Kim and J. M. Park
Pohang University of Science and Technology (POSTECH)

4:55 PM **Nanofibrillated Cellulose (NFC) Coat Weight Predictions when Coating onto Paper**
F. Richmond and D. W. Bousfield
University of Maine

5:15 PM **Laser- Drawn Features on Nanoparticle Films**
S. K. Kandpal, M. D. Mason, D. W. Bousfield and D. J. Neivandt
University of Maine

September 12, Wednesday AM Parallel

Technical Session 5: Wetting

co-chairs: **Terry Blake, University of Mons**
Pirouz Kavehpour, University of California, Los Angeles

8:15 AM **Dynamics of Dewetting**
T. Blake and J. De Coninck
University of Mons

8:35 AM **Microuidic Dynamic Wetting Flows: Modelling and Simulation**
J.E. Sprittles and Y. D. Shikhmurzaev
University of Oxford and University of Birmingham

8:55 AM **The Mechanism of Air Entrainment in the Slot Die Coating Process**
S. Didari, Z. Y. Ahmad, M. Perez and T. A. L. Harris
Georgia Institute of Technology

9:15 AM **Dynamic Wetting Failure in Coating Flows: The Influence of the Displaced Fluid**
E. Vandre, M. S. Carvalho and S. Kumar
University of Minnesota and PUC-Rio

9:35 AM Break

10:05 AM **Coating and Wetting of Semiconducting Organic and Hybrid Films: Fluid-dynamic Properties, Process Parameters, and Wetting Behavior**
L. Wengeler, M. Schmitt, K. Peters, P. Scharfer and W. Schabel
Karlsruhe Institute of Technology

10:25 AM **A Cylindrical Weir for the Application of Surfactants to Coating Processes**
N. Fulcher, D. Charles, K. Ruschak, M. Antoniadis and S. Weinstein
Rochester Institute of Technology

10:45 AM **Spreading of Emulsions on Solid Substrate**
A. Karin and P. Kavehpour
University of California, Los Angeles

11:05 AM **Fast Evaporation of Spreading Droplets of Colloidal Suspensions**
K. L. Maki and S. Kumar
University of Minnesota

11:25 AM **Fluid Penetration into Porous Media During Slot-die Coating**
X. Ding, T. F. Fuller and T. A. L. Harris
Georgia Institute of Technology

September 12, Wednesday AM Parallel

Technical Session 6: Flow and Solidification of Particulate Coatings

co-chairs: **Willi Schabel, Karlsruhe Institute of Technology**
Brian Higgins, University of California, Davis

8:15 AM **Edge Geometry Effects on the Microstructure Development of Drying Latex Coatings**
K. Price, L. Francis and A. McCormick
University of Minnesota

8:35 AM **Improved PEMFC Cathode Performance with Controlled Ionomer**
R. Koestner, I. Kozhinova, S. Kumaraguru and A. Nayar
GM Research and Development and Trison Business Solutions

8:55 AM **Toward Coating-Based Tissue Engineering: Microstructure Control of Vascular Endothelial Cell Sheets Using Shear Flow**
S. Ohta, S. Inasawa and Y. Yamaguchi
University of Tokyo

9:15 AM **Drying Influence on Film Properties of Lithium-ion Battery Electrodes**
M. Baunach, M. Schmitt, P. Scharfer and W. Schabel
Karlsruhe Institute of Technology

9:35 AM Break

10:05 AM **Rheological Cracks in Drying Colloidal Films**
Y. Yamaguchi
University of Tokyo

10:25 AM **Coupled CFD-DEM Simulation of Particle-laden Flows in Slot Die Coating System with Presence of Free Surfaces**
V. Akbarzadeh and A. N. Hrymak
McMaster University and University of Western Ontario

10:45 AM **Rheology and Solidification Microstructure via Mesoscale Modeling of Polydisperse Particle Suspensions**
P. R. Schunk, D. Bolintineanu, J. B. Lechman and F. Pierce
Sandia National Laboratories

11:05 AM **Coating Process Regimes in Particulate Film Production by Forced-Convection-Assisted Drag-Out**
D. D. Brewer, T. Shibuta, L. F. Francis, S. Kumar and M. Tsapatsis
University of Minnesota

11:25 AM **Wet Film Characterization of Slot Die Coated Multilayer Battery Electrodes**
M. Schmitt, M. Baunach, P. Scharfer and W. Schabel
Karlsruhe Institute of Technology

Poster Session - Sept. 10, Monday PM Sept. 11, Tuesday PM

co-chairs: **Wieslaw Suszynski, University of Minnesota**
Philip Scharfer, Karlsruhe Institute of Technology

Use of inkjet Technology for Precision Patterned Coatings
S. Liker, *Trident Industrial Inkjet*

Slot Die Material Innovations: Tungsten Carbide
T. Yasutake, *Mitsubishi Materials USA Corp*

Drying-Induced Variation in Pressure Inside Packed Colloidal Films and Subsequent Formation of Periodic Cracks
S. Inasawa and Y. Yamaguchi, *University of Tokyo*

Could a Die Be Disposable? — Design and Test of a Silicon-Wafer-Based Slot DieCoater
A. B. Wang, Y. W. Hsieh, Y. J. Liu and T. Y. Lin,
National Taiwan University, Institute of Applied Mechanics

Development of New Products with Optimized Slot Dies – THE Scalable Process
H. Doell, *TSE*

Surface Quality of Slot Die Coated Battery Electrodes with Special Attention to Edge Effects
M. Schmitt, M. Baunach, P. Scharfer and W. Schabel,
Karlsruhe Institute of Technology

Automotive Thermosetting Powder Coatings: an Investigation of the Relationship Between Final Finish Structure Spectrum and Viscosity
L. Prendi and P. Henshaw,
St. Clair College of Applied Arts & Technology and University of Windsor

Improving Resolution for Roll-to-Roll Printed Electronics
H. Zhang, W. Suszynski, C. D. Frisbie, L. Francis, C. Thode, J. De Pablo and P. Nealey
University of Minnesota and University of Wisconsin

Dependence of Opto-Electric Properties of (semi)Conducting Films in Polymer Based Solar Cells on Viscous Shear During the Coating Process
L. Wengeler, P. Scharfer and W. Schabel, *Karlsruhe Institute of Technology*

Effect of Absorbed Water on Active Biosensor Layers
S. Kachel, S. DuVall, P. Scharfer and W. Schabel, *Karlsruhe Institute of Technology*

Diffusion in Solution Processed Organic Multilayers
K. Peters, D. Siebel, P. Scharfer and W. Schabel, *Karlsruhe Institute of Technology*

Investigation of Heat Transfer within an Array of Impinging Jets with Local Extraction of Spent Fluid

P. Cavadini, L. Wengeler, P. Scharfer and W. Schabel,
Karlsruhe Institute of Technology

Development of New Gapman Gen3 Opens Up New Coating Application Opportunities
B. Manning and R. Foster, *Capacitec Inc.*

Improvement of Barrier Properties and Wettability of Biodegradable Coated Paper and Cardboard
I. Recalde, A. Devis, L. Prats, S. Aucejo, *Instituto Tecnológica del Embalaje Transportey Logistica (ITENE), Parque Tecnológico de Paterna*

Journal of Coatings Research & Technology (JCRT, Springer)

Selected papers will be considered for publication in the Journal of Coatings Research & Technology Special Issue on Advances in Coating and Drying of Thin Films. Submissions will be voluntary.

Please contact Prof. Hadj Benkreira (H.Benkreira@bradford.ac.uk) for more information.

The 15th International Coating Science and Technology Symposium was held at the Crowne Plaza St. Paul-Riverfront Hotel, located in St. Paul, Minnesota, September 12 - 15, 2010.

The Symposium was attended by coating engineers and researchers from academia and industry. Both Europe and Asia were represented in significant numbers.

Some comments from participants ...

"Great opportunity to network. I met some great new contacts."

"The variety of presentations was excellent. A lot of good down-to-earth presentations."

"The exhibit session was especially valuable. Keep encouraging companies to exhibit."

"What I learned from this symposium will be a great asset to my company."

"I appreciated learning new technology, the opportunity to connect with potential solutions, and the opportunity to network with technology leaders and colleagues."

"I saw a snapshot of what coating practitioners and coating-oriented academics are interested in, which was my goal in attending."

"Learning the latest in my field of research was very valuable."

Message from the Symposium Chair

It is important that Symposium attendees make every effort to stay at the Loews Atlanta Hotel, in order for the ISCST to meet its commitment to the hotel. This facility was selected in part to provide the convenient informal networking environment that our Symposium participants have been asking for and the Loews Atlanta Hotel has offered the ISCST a special rate. Thank you.

- Dr. W. Blake Kolb, Symposium Chair

Symposium Registration

The Symposium registration fee includes all sessions plus Sunday & Monday night reception, Monday, Tuesday & Wednesday continental breakfast and Monday and Tuesday lunch. The Short Courses are not included in the Symposium registration fee.

Register online at www.iscst.org. You may also call Mr. Terry Gorka at 805-340-0608 to register over the phone. We'll be happy to hold a seat for you for a limited period until payment is received.

THE TIARA GROUP, INC.



9452 Telephone Rd. #112 • Ventura, CA 93004
Tel: (805) 340-0608 • Fax: (805) 640-7178 • e-mail: tgorka@thetiargroup.com

Dr. Mr. Ms.

Name: First Last

Position/Title:

Company/Institution:

Address:

City, State/Province:

Zip/Postal Code:

Country:

Phone: Fax:

e-mail:

Registration (must be postmarked by August 13) \$745
Registration (postmarked after August 13) \$795
Additional Registrant from Same Company less \$50
Student Registration \$195
Faculty/Retiree Registration \$495
Tabletop Exhibit (includes one registration fee) \$1,095

Short Courses:

Web Handling Fundamentals (Sept. 8) \$795
Precision Coating and Solidification (Sept. 9) \$895

Check Enclosed Master Card Visa AMX

Card #

Exp. Date: Security Code:

Cardholder's Name:

- I do not plan to attend the opening reception on Sunday, Sept. 9
I would like vegetarian lunches.
Please do not include me on the registrant list for this Symposium for distribution to participants.

E-mail Address Request

Important updated information will be sent out via e-mail. Please send your e-mail address to tgorka@thetiargroup.com

Location Information & Reservations

The Loews Atlanta Hotel is located in Midtown, the geographic center of Atlanta between Downtown and Buckhead. Midtown is both charming and cosmopolitan, from enchanting cultural pursuits to adventures in dining and entertainment.

To make a reservation go to http://www.loewshotels.com/en/Atlanta-Hotel/GroupPages/coatingscience for a direct link to the Symposium reservation page. You may also call the Loews Atlanta Hotel at 888-563-9736 or 404-745-5000. Be sure to identify yourself as an attendee of the ISCST Symposium to receive the special rate of \$169, single and double occupancy, per night, plus tax. Reservations should be made by August 9, accepted on a space and rate available basis. You can reserve a room with a credit card or check (in U.S. dollars). A first night

deposit is required at the time of reservation. Room reservations cancelled prior to 24 hours before arrival will receive a full refund of first nights deposit. No-shows will be charged the first night room deposit. At check in, each guest will have the opportunity to reconfirm their departure date. Any guest departing prior to that date will be assessed a \$50 charge.

For more information about the Loews Atlanta Hotel go to http://www.loewshotels.com/en/Atlanta-Hotel

For Information Contact:

Mr. Terry Gorka, The Tiara Group, Inc.
tgorka@thetiargroup.com • 805-340-0608 • Fax: 805-323-5074