The PTF is an international and interdisciplinary forum that promotes information exchange, scholarship, research, and education in the field of particle technology – that branch of science and engineering dealing with the production, handling, modification, and use of a wide variety of particulate materials, both wet or dry, in sizes ranging from nanometers to centimeters. Particle technology spans a range of industries to include chemical, petrochemical, agricultural, food, pharmaceuticals, mineral processing, advanced materials, energy, and the environment. See [www.erpt.org/ptf](http://www.erpt.org/ptf) for more information.

### In this issue…

- News and Announcements .................................................. 2
- ♦ Letter from the Chair .................................................. 2
- ♦ 2009 AIChE Annual Meeting ........................................... 3
- ♦ Call for PTF Nominations ............................................... 5
- ♦ International Conference on Multiphase Flow .................. 10
- ♦ WCPT6 ........................................................................... 11
- ♦ AIChE Webinars .............................................................. 11
- ♦ Best Paper Awards from 2008 AIChE Annual Meeting ....... 12
- ♦ Snapshots from 2008 AIChE Annual Meeting .................. 13
- ♦ “Know Floe’s Korner” ...................................................... 18
- Upcoming Conference Calendar .......................................... 21
- PTF Organizational Information ........................................... 23
- ♦ Officer and Committee Listing .......................................... 23
- ♦ From the Editor’s Desk .................................................... 25
- ♦ Moving? New E-mail? ....................................................... 25
- ♦ Membership Information ................................................ 26
LETTER FROM THE CHAIR

This is my first year as a chair of the forum and I am really looking forward to the opportunity to work with the particle technology community for the next two years. I would like to use the occasion of this newsletter to highlight two important things that I believe make a forum like ours valuable to the particle technology community.

First of all, particle technology is a lively and challenging field. A simple analysis of the work presented at the 2008 Annual Meeting shows our strength. There were a total of 287 contributions including two award lectures, 40 posters and 245 oral presentations. More than 22 countries were represented in the program. At our annual dinner, attended by more than 100 of our colleagues, the PTF recognized four of our members with major awards, and 5 papers and 3 posters presented at the 2007 Annual Meeting for their technical contributions. Our field continues to evolve with a dramatic increase in research in material synthesis, novel characterization methods, computational analyses of particulate systems, and technologies for biomass conversion, novel clean fuels production and capture of greenhouse gases. The particle technology community is contributing significantly to the understanding of how to process difficult materials, such as nanoparticles, and to use sophisticated mathematical modeling to reduce or avoid costly experimentation, as in the design of circulating fluidized beds. The behavior of granular materials is now recognized as a major field in the physical sciences with large research efforts that go beyond the traditional engineering disciplines. These are exciting developments for all of us in the industrial and academic environments.

An unassuming but significant contribution was made by Shrikant Dhodapkar, Ray Cocco, Jennifer Curtis and Barry Tarmy. At the Career Fair in Philadelphia, they presented a particle technology tutorial directed towards undergraduates looking into their technological future. Programs such as these should be a standing part of our effort to inform the engineering community of the impact and contribution of particle technology across the spectrum of technical and societal challenges.

Second, and most important of all, the diverse activities sponsored by the PTF provide an element of personal contact among our members that enriches all of us, both technically and personally. It’s our challenge to extend this communication beyond the confines of a few annual meetings. We are hoping that technology, such as the effort spearheaded by Pat Spicer to enrich our web page, will allow us to do that. This is after all a human enterprise.

I cannot complete this letter without some acknowledgements. On behalf of the entire membership, I would like to extend my appreciation to my predecessor, Shrikant Dhodapkar. It will be difficult to match his dedication but, hopefully, with the support of the Executive Committee (Stephen Conway, Jennifer Sinclair Curtis, Joseph McCarthy, Ecevit Bilgili, George Fotou, Hamid Arastapoor, Greg Mehos and Alissa Park), we will at least be able to equal his achievements. I would like to specifically thank in advance two individuals without whom the key functions of the PTF would not be completed. The first is our vice-chair, Ray Cocco, who will succeed me at the end of my term. He will assume the yeoman’s responsibility for many of the tasks that make our meetings a success. In addition, Manuk Colakyan, has been the steady, and smart, hand organizing the annual sessions and deserves full recognition for the effort that he has voluntarily committed to the group over numerous years. I am truly happy to have the opportunity to be working with both of them over the coming two years.

Last, but not least, the members of the PTF – it is only through your active participation that the PTF works for all of us.

Hugo Caram
Chair – Particle Technology Forum
## 2009 AIChE Annual Meeting

**November 8-13, 2009**  
**Gaylord Opryland Hotel**  
**Nashville, TN**  
**Abstract Deadline: May 11, 2009**  
**URL:** [http://www.aiche.org/Conferences/AnnualMeeting/index.aspx](http://www.aiche.org/Conferences/AnnualMeeting/index.aspx)

<table>
<thead>
<tr>
<th>PTF Session</th>
<th>Chair</th>
<th>Co-Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agglomeration and Granulation Processes</td>
<td>Paul Mort</td>
<td>Gabriel I. Tardos</td>
</tr>
<tr>
<td>Aggregate and Agglomerate Formation Dynamics</td>
<td>Gregory Beaucage</td>
<td>Paul Mort</td>
</tr>
<tr>
<td>Applications of Cfd and Population Balance Modeling During Development and Scale-up of Particulate Processes</td>
<td>Pavol Rajniak</td>
<td>Miroslav Soos</td>
</tr>
<tr>
<td>Applications of Engineered Structured Particulates</td>
<td>Ranjit Thakur</td>
<td>Wai Kiong Ng</td>
</tr>
<tr>
<td>Applications of Fluidization</td>
<td>Manuk Colakyan</td>
<td>Isaac K. Gamwo</td>
</tr>
<tr>
<td>Challenging Problems in Solids Handling – Panel Discussion</td>
<td>Shrikant Dhodapkar</td>
<td></td>
</tr>
<tr>
<td>Characterization and Measurement in Powder Processing</td>
<td>Clive E. Davies</td>
<td>Steve J. Tallon</td>
</tr>
<tr>
<td>Characterization of Engineered Particles and Nano-Structured Particles</td>
<td>Stephen L. Conway</td>
<td>Ah-Hyung Alissa Park</td>
</tr>
<tr>
<td>Circulating Fluidized Beds</td>
<td>Juraj De Wilde</td>
<td>Allan Issangya</td>
</tr>
<tr>
<td>Comminution – Experiments, Theory &amp; Modeling</td>
<td>Priscilla Hill</td>
<td>R. Bertrum Diemer</td>
</tr>
<tr>
<td>Computational and Numerical Approaches to Particle Flow</td>
<td>Jennifer S. Curtis</td>
<td>Chao Zhu</td>
</tr>
<tr>
<td>Dynamics and Modeling of Particles, Crystals and Agglomerate Formation</td>
<td>Jan Sefcik</td>
<td>Roger Place</td>
</tr>
<tr>
<td>Dynamics and Modeling of Particulate Systems I</td>
<td>Carl R. Wassgren</td>
<td>Vinit S. Murthy</td>
</tr>
<tr>
<td>Dynamics and Modeling of Particulate Systems II</td>
<td>Carl R. Wassgren</td>
<td>Vinit S. Murthy</td>
</tr>
<tr>
<td>Environment and Lifecycle</td>
<td>Charles R. Painter</td>
<td>Chester Clark</td>
</tr>
<tr>
<td>Fluid-Particle Processing, Liquid-Particle Processing</td>
<td>James F. Gilchrist</td>
<td></td>
</tr>
<tr>
<td>Fluidization and Fluid-Particle Systems for Gasification and Biomass Utilization</td>
<td>L.-S. Fan</td>
<td>Atsushi Tsutsui</td>
</tr>
<tr>
<td>Fluidization and Handling of Submicron and Nano Particles</td>
<td>Jesse Zhu</td>
<td></td>
</tr>
<tr>
<td>Functional Nanoparticles and Nanocoatings on Particles</td>
<td>Lutz Mädler</td>
<td>Alexandra Teleki</td>
</tr>
<tr>
<td>Fundamentals of Fluidization – I</td>
<td>T. C. Ho</td>
<td>Ah-Hyung Alissa Park</td>
</tr>
</tbody>
</table>
News and Announcements

<table>
<thead>
<tr>
<th>Topic</th>
<th>Author(s)</th>
<th>Email(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamentals of Fluidization – II</td>
<td>Bruce D. Hook</td>
<td><a href="mailto:BDHook@dow.com">BDHook@dow.com</a></td>
</tr>
<tr>
<td>Gas Phase Synthesis of Nanoparticles</td>
<td>Robert N. Grass</td>
<td><a href="mailto:robert.grass@chem.ethz.ch">robert.grass@chem.ethz.ch</a></td>
</tr>
<tr>
<td>Gas/Solid Mixing and Heat/Mass Transfers in Fluidized Beds</td>
<td>Hadjira Iddir</td>
<td><a href="mailto:Hadijra.Iddir@uop.com">Hadijra.Iddir@uop.com</a></td>
</tr>
<tr>
<td>Handling of Nanoparticles</td>
<td>Gary Liu</td>
<td><a href="mailto:Gary.Liu@usa.dupont.com">Gary.Liu@usa.dupont.com</a></td>
</tr>
<tr>
<td>Health and Environmental Effect of Nanoparticles</td>
<td>Wendelin J. Stark</td>
<td><a href="mailto:wendelin.stark@chem.ethz.ch">wendelin.stark@chem.ethz.ch</a></td>
</tr>
<tr>
<td>Industrial Application of Computational and Numerical Approaches to Particle Flow</td>
<td>Ray A. Cocco</td>
<td><a href="mailto:ray.cocco@psrichicago.com">ray.cocco@psrichicago.com</a></td>
</tr>
<tr>
<td>Liquid-Phase Synthesis of Nanomaterials and Particles</td>
<td>Jan Sefcik</td>
<td><a href="mailto:jan.sefcik@strath.ac.uk">jan.sefcik@strath.ac.uk</a></td>
</tr>
<tr>
<td>Magnetic Particle Synthesis and Properties</td>
<td>Robert N. Grass</td>
<td><a href="mailto:robert.grass@chem.ethz.ch">robert.grass@chem.ethz.ch</a></td>
</tr>
<tr>
<td>Material Parameters for Particle Simulations</td>
<td>Joerg Theuerkauf</td>
<td><a href="mailto:Jtheuerkauf@dow.com">Jtheuerkauf@dow.com</a></td>
</tr>
<tr>
<td>Mixing and Segregation of Particulates</td>
<td>Ben Glasser</td>
<td><a href="mailto:bglasser@sol.rutgers.edu">bglasser@sol.rutgers.edu</a></td>
</tr>
<tr>
<td>Modeling and Scaleup of Nanoparticle Processes</td>
<td>M. Silvina Tomassone</td>
<td><a href="mailto:silvina@soemail.rutgers.edu">silvina@soemail.rutgers.edu</a></td>
</tr>
<tr>
<td>Nano-Energetic Materials</td>
<td>Jan A. Puszynski</td>
<td><a href="mailto:Jan.Puszynski@sdsmt.edu">Jan.Puszynski@sdsmt.edu</a></td>
</tr>
<tr>
<td>Nanoparticles by Mechanical Breakage and Size Reduction</td>
<td>Karsten Wegner</td>
<td><a href="mailto:wegner@ptl.mavt.ethz.ch">wegner@ptl.mavt.ethz.ch</a></td>
</tr>
<tr>
<td>Nanostructured Particles for Catalysis</td>
<td>J. Ruud Van Ommen</td>
<td><a href="mailto:j.r.vanommen@tnw.tudelft.nl">j.r.vanommen@tnw.tudelft.nl</a></td>
</tr>
<tr>
<td>Particle and Powder Characterization for Scale-up and Simulations</td>
<td>Shrikant Dhodapkar</td>
<td><a href="mailto:sdhodapkar@dow.com">sdhodapkar@dow.com</a></td>
</tr>
<tr>
<td>Particle Formation and Crystallization Processes from Liquids, Slurries and Emulsions</td>
<td>Reginald B.H. Tan</td>
<td><a href="mailto:reginald_tan@ices.a-star.edu.sg">reginald_tan@ices.a-star.edu.sg</a></td>
</tr>
<tr>
<td>Population Balance Modeling for Particle Formation Processes: Nucleation, Aggregation and Breakage Kernels</td>
<td>Roger Place</td>
<td><a href="mailto:rogerplace@compuserve.com">rogerplace@compuserve.com</a></td>
</tr>
<tr>
<td>Post Crystallization Processes</td>
<td>Bruce D. Hook</td>
<td><a href="mailto:BDHook@dow.com">BDHook@dow.com</a></td>
</tr>
<tr>
<td>Processing and Safety</td>
<td>Dilhan M. Kalyon</td>
<td><a href="mailto:dkalyon@stevens.edu">dkalyon@stevens.edu</a></td>
</tr>
<tr>
<td>Selected Reviews on Fluidization</td>
<td>Jesse Zhu</td>
<td><a href="mailto:jzhu@uwo.ca">jzhu@uwo.ca</a></td>
</tr>
<tr>
<td>Solids Handling and Processing</td>
<td>Kenneth J. Ford</td>
<td><a href="mailto:kenneth_ford@merck.com">kenneth_ford@merck.com</a></td>
</tr>
<tr>
<td>Solids Processing for Polymers</td>
<td>Bruce D. Hook</td>
<td><a href="mailto:BDHook@dow.com">BDHook@dow.com</a></td>
</tr>
<tr>
<td>Thermophysical Properties</td>
<td>Veera Boddu</td>
<td><a href="mailto:veera.boddu@usace.army.mil">veera.boddu@usace.army.mil</a></td>
</tr>
</tbody>
</table>

PTF Newsletter 4  Spring 2009
Call for PTF Nominations

BEST PH.D. IN PARTICLE TECHNOLOGY AWARD

Winner: 2008 – Janine Galvin
Sponsor: Proctor and Gamble

Description: Recognizes an outstanding dissertation by an individual who has earned a doctoral degree. The dissertation can be in any discipline in the physical, biomedical or engineering sciences, but must be in particle science and engineering. Selection criteria include: 1. An outstanding original dissertation with relevance to particle technology. 2. The candidate must have received a doctoral degree within the last three calendar years prior to the year the award is given.

Deadline: June 15, 2009. Nominations can be made by any member of the Particle Technology Forum. Nominations should include (1) a letter of nomination, which should include a critical review stating the value of the dissertation in terms of its originality, significance, and potential applications in the field of particle science and technology, (2) an extended abstract of up to six pages including a list of refereed publications resulting directly from that dissertation, (3) a list of refereed publications resulting directly from that dissertation, (4) at least three supporting letters, all of which must be from institutions outside the one granting the dissertation and focus on at least the value of the dissertation in terms of its originality, significance, and potential applications in the field of particle science and technology, and (5) at least one letter from industry. Send nominations to the Particle Technology Forum Awards Committee Chair: Dr. Ray Cocco, Particulate Solid Research, Inc., 4201 West 36th Street, Suite 200, Chicago, IL 60632; Phone: 773-523-7227; Fax: 773-299-1007; E-mail: ray.cocco@psrichicago.com

Award: A plaque and a $500 honorarium.

Presentation: The award is presented at a PTF-sponsored event during the AIChE Annual Meeting.

Past Recipients: 2007 Mahesh Iyer 2006 Griselda Bonilla
2005 Stephen L. Conway 2004 Ecevit Bilgili
2003 Stephen Tallon 2002 Himanshu Gupta
2000 H. Shinto 1999 R. Agnihotri
1998 Pat Spicer 1997 Christine M. Hrenya
PARTICLE TECHNOLOGY FORUM AWARD

Winner(s): 2008 – L.S. Fan

Sponsor(s): E.I. duPont de Nemours & Company

Description: Recognizes a forum member's significant scientific/technical contributions to the field of particle technology, as well as leadership in promoting scholarship, research, development, or education in this field. Nominee has to be a member of the Particle Technology Forum.

Deadline: June 15, 2009. Nominations for this year's PTF Award can be made by any member of the Particle Technology Forum. Nominations should include: (1) a letter of nomination, which should include a detailed review of contributions made to the field of particle technology with focus on its originality, significance, and potential applications in the field. The letter should also include reference to leadership in promoting scholarship, research, development, or education in PTF field, (2) a list of relevant publications, (3) at least three supporting letters, all of which must be from institutions outside the one granting the dissertation, and (4) at least one letter from industry. Please indicate in the nomination if you would like the nominee to also be considered for the Thomas Baron Award, and the PTF Forum Award. Send nominations to the Particle Technology Forum Awards Committee Chair: Dr. Ray Cocco, Particulate Solid Research, Inc., 4201 West 36th Street, Suite 200, Chicago, IL 60632; Phone: 773-523-7227; Fax: 773-299-1007; E-mail: ray.cocco@psrichicago.com

Award: A plaque and $1,000 honorarium.

Presentation: The award is presented at a PTF-sponsored event during the AIChE Annual Meeting.

2005 J. Schwedes 2004 George Klinzing
2003 Chi Tien 2002 Brian Kaye
2001 S. K. Friedlander 2000 Brian Scarlett
1998 Andrew W. Jenike 1997 Reg Davies
1996 K. Leschonski 1995 Robert Pfeffer
Lectureship Award in Fluidization

Winner: 2008 – Robert Pfeffer
Sponsor: Particulate Solid Research, Inc.
Description: Recognizes an individual's outstanding scientific/technical research contributions with impact in the field of fluidization and fluid-particle flow systems. Selection criteria include: 1. An outstanding contribution advancing fluidization or fluid-particle flow systems. 2. The awardee is required to deliver a keynote paper at the Fundamentals of Fluidization and Fluid-Particle Systems session of Area 3b during the AIChE Annual Meeting. The awardee is also required to submit a written manuscript. 3. Membership in the Particle Technology Forum or AIChE is not required.
Deadline: June 15, 2009. Nominations for this year’s Lectureship Award in Fluidization can be made by any member of the Particle Technology Forum. Nominations should include: (1) A letter of nomination, which should include a detailed review of contributions made to the field of fluidization and fluid-particle systems with focus on originality, significance, and potential applications, (2) a list of relevant publications, (3) at least three supporting letters, all of which must be from institutions outside the one granting the dissertation, and (4) at least one letter from industry. Nominations should be sent to Dr. Ray Cocco, the Particle Technology Forum Awards Committee Chair at Particulate Solid Research, Inc., 4201 West 36th Street, Suite 200, Chicago, IL 60632; Phone: 773-523 7227; Fax: 773-299-1007; E-mail: ray.cocco@psrichicago.com.
Award: A plaque and a $1,000 honorarium.
Presentation: The award is presented at a Forum sponsored event during the AIChE Annual Meeting.
Past Recipients:
2007 Jennifer Sinclair Curtis 2006 Yong Jin
2005 Shigekatsu Mori 2004 Ye Mon Chen
2003 Norman Epstein 2002 Dimitri Gidaspow
2001 M. Horio 2000 Wen Ching Yang
1999 Hamid Arastoopour 1998 Joachim Werther
1997 M. Kwauk
**FLUIDIZED PROCESSING RECOGNITION AWARD**

Winner(s): 2007 – Ye Mon Chen

Sponsor(s): Dow Chemical Company

Description: Recognizes a Forum member who has made significant contribution to the science and technology of fluidization or fluidized processes, and who has shown leadership in the engineering community. Awarded bi-annually in odd numbered years.

Deadline: June 15, 2009. Nominations for this year’s Fluidized Processing Recognition Award can be made by any member of the Particle Technology Forum. Nominations should include: (1) a letter of nomination, which should include a detail review of contributions made to the field of fluidization and fluidized process. The letter should also include reference to leadership in the engineering community, (2) a list of relevant publications, (3) at least three supporting letters, all of which must be from industry. Two of which should be from outside the company or organization affiliated with the nominee, and (4) at least one letter from academia. Send nominations to the Particle Technology Forum Awards Committee Chair: Dr. Ray Cocco, the Particle Technology Forum Awards Committee Chair at Particulate Solid Research, Inc., 4201 West 36th Street, Suite 200, Chicago, IL 60632; Phone: 773-523-7227; Fax: 773-299-1007; E-mail: ray.cocco@psrichicago.com.

Award: A plaque and $500.

Presentation: The award is presented at a PTF-sponsored event at the AIChE Annual Meeting.

Past Recipients:
- 2005 Manuk Colakyan
- 2001 Desmond King
- 1997 Al Weimer
- 1994 Tim Allen
- 2003 Hamid Arastoopour
- 1999 John Chen
- 1995 L.S. Fan
- 1993 Wen Ching Yang
**THOMAS BARON AWARD IN FLUID-PARTICLE SYSTEMS**

Winner(s): 2008 – Dilhan Kalyon  
Sponsor(s): Shell Global Solutions, Inc.  
Description: Recognizes an individual's outstanding scientific/technical accomplishment which has made a significant impact in the field of fluid-particle systems or in a related field with potential for cross-fertilization. Selection criteria include: 1. An outstanding contribution advancing fluid-particle systems, or a related field. 2. The awardee is invited to deliver a Plenary Lecture at an AIChE Annual Meeting session. The awardee is also required to submit a written manuscript.  
Deadline: June 15, 2009. Nominations for this years PTF Award can be made by any member of the Particle Technology Forum. Nominations should include: (1) a letter of nomination, which should include a detail review of contributions made to the field of fluid-particle systems or in a field with potential for cross-fertilization, (2) a list of relevant publications, (3) at least three supporting letters, all of which must be from institutions outside the one granting the dissertation, and (4) at least one letter from industry.  
Award: A plaque and $1,000.  
Presentation: The award is presented at a PTF-sponsored event during the AIChE Annual Meeting.  
Past Recipients:  
2007 John R. Grace  
2005 Sankaran Sundaresan  
2003 Sotiris Pratsinis  
2001 L. White  
1998 S.L. Soo  
1996 D. D. Joseph  
1994 L. Fan  
2006 Dimitri Gidaspow  
2004 Doraiswamy Ramkrishna  
2002 Darsh Wasan  
2000 Robert Pfeffer  
1997 R. C. Flagan  
1995 John C. Chen  
1993 Roy Jackson
International Conference on
Multiphase Flow

www.ICMF2010.eng.ufl.edu

May 30 - June 4, 2010
Marriott Waterside
Hotel & Marina
Tampa, Florida, USA

Host Institution: University of Florida

Conference Topics
- Bio-Fluid Dynamics
- Boiling
- Bubbly Flows
- Cavitation
- Colloidal and Suspension Dynamics
- Collision, Agglomeration and Breakup
- Computational Techniques for Multiphase Flows
- Droplet Flows
- Environmental and Geophysical Flows
- Experimental Methods for Multiphase Flows
- Fluidized and Circulating Fluidized Beds
- Fluid Structure Interactions
- Granular Media
- Industrial Applications
- Instabilities Interfacial Flows
- Micro and Nano-Scale Multiphase Flows
- Microgravity in Two-Phase Flow
- Multiphase Flows with Heat and Mass Transfer
- Non-Newtonian Multiphase Flows
- Particle-Laden Flows
- Particle, Bubble and Drop Dynamics
- Reactive Multiphase Flows

Abstract Deadline: September 15, 2009
icmf-2010@ufl.edu
The World Congress on Particle Technology (WCPT6) is a scientific congress which is now supported by PARTEC, one of the largest particle technology related events in Europe. WCPT6 will take place simultaneously with POWTECH and TechnoPharm at NürnbergMesse. This fusion of greatest minds in this area of science will provide an amazing exhibition of particle technology for both pharmaceutical and nonpharmaceutical-related fields. This joint venture will present the largest display of process equipment and handling, along with a very unique opportunity for everyone attending to be part of in-depth discussions, scientific presentations for particle processes, its new applications, and know-hows.

WCPT6 will address: aerosols, multi-phase separations, models and simulations, crystallizations, granulations, particle characterizations, comminutions, nano-particles, interphase-controlled systems and processes, as well as bulk solids and applications thereof in the industries of food, pharmaceuticals, electronics, and materials.

Abstracts due July 1, 2009
Conference Website: www.wcpt6.org

The AIChE Webinar Series Requests Your Suggestions

AIChE features one-hour webinars on all topics of interest to chemical engineers. Please suggest a topic or speaker by filling out our Webinar Proposal Form and submitting to the content committee. The form can be found at http://www.aiche.org/uploadedFiles/Conferences/DepartmentUploads/PDF/3680.final.pdf. We look forward to your suggestions!
Best Paper Awards from 2008 AIChE Annual Meeting

Sponsored By: Jenike and Johanson, Inc.

2008 Best Paper Awards in Each Division

Group A

Paper 402A
“Use of Co-Milling to Improve Physical Stability of Amorphous Salbutamol Sulphate”

Wai Kiong Ng(1), Vivian S.Y. Wong (2), Prashant N. Balani (2), Sui Yung Chan (2), Reginald B. H. Tan (3)

(1) Crystallisation and Particle Science, Institute of Chemical and Engineering Sciences, 1 Pesek Road, Singapore, 627833, Singapore,
(2) Department of Pharmacy, National University of Singapore, 18 Science Drive 4, Singapore, 117543, Singapore,
(3) Crystallisation and Particle Sciences, Institute of Chemical and Engineering Sciences, 1, Pesek Road, Jurong Island, Singapore 627833, Singapore, Singapore

Group B

Paper 399A
“Syngas Chemical Looping Process”

Fanxing Li, Deepak Sridhar, Hyung Rae Kim, Liang Zeng, Fei Wang, L.-S. Fan
Ohio State University, Ohio, USA

Group C

Paper 445F
“Density Measurements in a Vibro-Fluidized Deep Granular Bed”

Kenneth J Ford, James Gilchrist, and Hugo Caram
Lehigh University, Pennsylvania, USA

Group D

Paper 429A
“Particle Breakage in the Nanometer Range”

Catharina Knieke and Wolfgang Peukert
Institute of Particle Technology, University of Erlangen, 91058 Erlangen, Germany.

Group E

Paper 547C
“Aluminum Burn Rate Modifiers Based on Reactive Nanocomposite Powders”

Demetrios Stamatis, Xianjin Jiang, and Edward L. Dreizin.
New Jersey Institute of Technology, Newark, New Jersey, USA
News and Announcements

2008 Best Poster Awards in Particle Technology

First place
“The Role of Gas-Aerosol Mixing during In-Situ Coating of Flame-Made Titania Particles”
Alexandra Teleki, Martin C. Heine, Frank Krumeich, Kamal M. Akhtar, Sotiris E. Pratsinis

Second place
“Synthesis of Nanoscale Cobalt-Iron Spinel Oxides Via Atomic Layer Deposition and Their Applications for Solar Thermochemical Water Splitting”
Jonathan R. Scheffe, Anthony H. McDaniel, Nathan P. Siegel, Mark D. Allendorf, Alan W. Weimer
University of Colorado at Boulder

Third place
“Modeling of An Industrial Vibrating Double-Deck Screen of a Urea Granulation Circuit”
Ivana Cotabarren, José Rossit, Juliana Piña, Verónica Bucalá
Universidad Nacional del Sur, Camino La Carridanga, Bahia Blanca, Argentinian

Fourth place
“Numerical Simulation of Granular Flow In a Bladed Mixer”
Brenda Remy, Johannes G. Khinast, Benjamin J. Glasser
Rutgers University, New Jersey, USA

Snapshots from 2008 AIChE Annual Meeting
News and Announcements

PTF Newsletter  Spring 2009
News and Announcements
“Know Floe’s Korner”

Challenges in Handling Fine Powders: Flooding, Flushing and Deaeration

Lyn Bates, Ajax Equipment, UK
Shrikant Dhodapkar, The Dow Chemical Company, TX
George Klinzing, University of Pittsburgh, PA

1. Fine powders with low permeability will exhibit fluid-like behavior due to high degree of aeration and subsequent low de-aeration rates. Uncontrolled and unpredictable discharge of fine powders out of process vessels is called flooding or flushing. Fine powders can flow uncontrollably through belt feeders, vibratory feeders or screw feeders since they rely on cohesion and angle of repose to contain the bulk solid. Fine powders also leak through the clearances of a rotary feeder under a surcharge pressure. These features pose major problems in handling fine powders for industrial applications.

2. Excess gas in the interstitial voids partially supports compacting loads and opposes the development of shear strength, allowing the mass to behave similar to a liquid of very low viscosity. In contrast, the same material in a settled condition exhibits extreme flow difficulties due to its poor permeability which inhibits the expansion of the bulk solids.

3. The flooding tendency of a powder depends both on the bulk material characteristics (particle size, size distribution, permeability, particle density) and on the process conditions (strain rate, discharge rate, residence time, surcharge load or pressure, process temperature, flow pattern). Powders with flooding tendency can, therefore, be handled satisfactorily if proper control of process conditions is maintained.

4. Typical mechanisms for flooding are -
   a. As the powder from top surface of a rathole (in a funnel flow bin) sloughs off and falls down towards the outlet, it entrains air which causes it to fluidize and flood out of the feeder.
   b. The residence time of powder in the central core in a bin with funnel flow pattern can be very short. If incoming material is not sufficiently de-aerated during its transit time to the feeder, it may flood on reaching the exit.
   c. If a vessel is filled rapidly with fine powder and discharged without allowing sufficient time to de-aerate, flooding may take place.
   d. If the relative velocity between particle and air at the silo outlet is higher than minimum fluidization velocity, the powder is likely to fluidize and flood out.
   e. Uncontrolled air injection in hoppers can result in localized fluidization and create surcharge pressures which aggravate the tendency to flood.

5. Recognize the potential behaviour variation by relating a sample to the Geldart diagram. Bulk materials falling into Class ‘C’ are likely to experience radical differences in flow characteristics according to the state of dilatation and slow to de-aerate when fluidised by agitation or excess air entrainment. Materials with Geldart Class “A” are also prone to flooding if sufficient de-aeration time is not adequate.
6. Note that the viscosity of gases increase with temperature, so that the escape of void gas by percolation is impeded by increased viscous drag at higher temperatures, hence the output from dryers, kilns or other hot regions will exacerbate fluidity problems. These may also be sensitive to ambient variation due to weather or site circumstances.

7. A hopper designed for mass flow will not function as such if the internal friction is less than wall friction, the latter not being affected by dilation of the bulk. Even if the stored contents of a hopper are such as to mass flow, the converging section will experience a velocity gradient. The dilated product in the central region will exert a hydrostatic pressure that overcomes the minimum principle stress of the boundary material to progressively penetrate the bed and may eventually flood.

8. There exists a critical strain rate where the material behavior changes from rate-independent transmitted shear stress (powder-like flow) to rate-dependent liquid-like flow. This transition can be sharp or fuzzy but high flow rates increase the flooding risk.

9. Segregation of fines fraction (esp. fraction rich in particle sizes less than 40 m) within a silo can create a potential for flooding. Fine fractions lower the critical strain rate required to change bulk material into a liquid like state. Segregation will also cause variations in bulk density, product flowability and product composition (for multi-component mixtures).

10. Measures available to address flooding problems in industrial applications -
   a. Avoid Funnel Flow pattern in a bin/hopper
   b. Retain heel of material in bin to avoid immediate discharge from filling.
   c. Use tangential entry of material as it is fed pneumatically into a bin/silo. Vertical impact can exacerbate fluidization and segregation.
   d. Design to minimize segregation of fines and coarse
   e. Allow for sufficient storage/residence time for the material to de-aerate before discharging.
   f. Minimize surcharge load or gas pressure on top of the bin; ensure good venting.
   g. Avoid uncontrolled air injection as a flow aid. Provide a continuous, limited-volume rate, air bleed in the region adjacent to the hopper outlet to prevent the void volume and pressure reducing to a value that cannot supply the expansion required for flow to take place. Note that the air injection rate required is very small compared with the rate of loss during settlement of a highly aerated mass. Interesting Fact: Jenike[2] used an aquarium pump to inject air into the anthracite hopper to solve the discharge rate problem.
   h. Consider the use of static de-aeration devices, such as vertical rods or wires, to enhance de-aeration rates. The porosity of packed bed near the wall is slightly higher than in the center. Place a fluidised powder in a deep transparent tube and you will see 'rivulets' of gas run up the walls of a container as gas flow reinforces weak escape channels, rather than work through the close packed bed away from the container surface. Place a thin wire in the centre of the container and a small 'volcano' of gas will erupt at the surface as the 'statistical empty space' forms a deep hole in the bed for air to short circuit the tortuous path through the interstices of a close packed array.
   i. The above effect can be enhanced by rotating the vertical rods at a natural frequency to generate vertical holes between the nodes in deep beds to short-circuit the gas exit route. Alternately, fit inclined plates that accumulate rising gas from underneath and provide a region shielded from overpressures up which the gas can travel. The contact pressure of the solids under the plates is very low and particles are easily displaced by the increasing gas flow. Inverted 'V' fittings with vent pipes to the headspace to provide a local unconfined surface.
j. Exploit plane flow and extended outlet slots with progressive extraction to enhance storage capacity for additional residence time and reduce hopper flow velocities and velocity gradients during discharge. An 'extended outlet slot with progressive extraction' is a long hopper outlet (typically served by a screw or belt feeder) which generates “live feed” over the total length. This construction allows a 'V' shaped hopper to be employed that provides plane flow for better discharge than a round or square opening. A 'V' shaped hopper also has more capacity as compared to a conical hopper by virtue of the lower wall inclinations permissible by plane flow. More capacity and larger cross section of flow channel means greater residence time and lower flow velocities that are both favourable for avoiding flooding. It should be noted that the maximum allowable working pressure may be limited for a V shaped hopper design due to flat surfaces.

k. Consider a large “Inverted Cone Insert” with a relatively narrow annulus, under which is a converging cone where the powder will reliably slide to the final outlet. The flow area of a large, but narrow, annulus can be many times greater than the final outlet because the area increases as the square of the diameter. This will greatly reduce the flow velocity and provide a shallow, unconfined surface under the insert for further de-aeration.

Useful References:
1. R.L. Carr, Chem. Eng. (Feb 1, 1965) 69
8. J.M. Kirby, Powder Technology, 44 (1985) 69-75
15. S. Jing, H. Li, Powder Technology, 103 (1999) 297-299

For questions regarding this article, send email to -

Lyn Bates: lynflow@btinternet.com
Shrikant Dhodapkar: sdhodapkar@dow.com
George Klinzing: klinzing@pitt.edu

PTF Newsletter  20  Spring 2009
2009

**Upcoming Conference Calendar**

**International Symposium on Agglomeration 2009**
June 22-26, 2009, Sheffield, UK
   Abstract deadline: passed
   Website: [http://www.shef.ac.uk/agglom2009/](http://www.shef.ac.uk/agglom2009/)

**Particles 2009 - Micro- and Nano-Encapsulation**
July 11-14, 2009, Berlin, Germany
   Abstract deadline: passed
   Website: [http://nanoparticles.org/Particles2009/](http://nanoparticles.org/Particles2009/)

**Powders & Grains 2009**
July 13-17, 2009, Golden, Colorado
   Abstract deadline: passed
   Website: [http://PandG2009.mines.edu](http://PandG2009.mines.edu)

**8th World Congress of Chemical Engineering (with Topical Conference on Particle Technology)**
August 23-27, 2009, Montreal, Canada
   Abstract deadline: passed
   Website: [http://www.wcce8.org](http://www.wcce8.org)

**2009 Annual AIChE Meeting**
November 8-13, 2009, Nashville, TN
   Abstract deadline: May 11, 2009
   Website: [http://www.aiche.org/Conferences/AnnualMeeting/index.aspx](http://www.aiche.org/Conferences/AnnualMeeting/index.aspx)

**Southern Workshop on Granular Matter 2009**
November 30–December 4, 2009, Viña del Mar, Chile
   Abstract deadline: October 1, 2009
   Website: [http://www.dfi.uchile.cl/~granular09/](http://www.dfi.uchile.cl/~granular09/)
Seventh International Conference on Computational Fluid Dynamics in the Minerals and Process Industries
December 9-11, 2009, Melbourne, Australia
   Abstract deadline: passed

2010

Sixth World Congress in Particle Technology
April 26-29, 2010, Nuremberg, Germany
   Abstract deadline: July 1, 2009
   Website: http://www.wcpt6.org

FLUIDIZATION XIII
May 16-19, 2010, Korea
Website: http://www.engconfintl.org/10af.html

International Conference on Multiphase Flow
May 30 - June 4, 2010, Tampa, FL
   Abstract Deadline: September 15, 2009
   Website: http://conferences.dce.ufl.edu/ICMF2010/

2010 AIChE Annual Meeting
October 17-22, 2010, Salt Lake City, Utah

2011

2011 AIChE Annual Meeting
October 16-21, 2011, Minneapolis, MN
PTF Organizational Information

Officer and Committee Listing

Officers:
Chair 2008-2012: Professor Hugo S. Caram, hsc0@lehigh.edu, 610-758-4259
Vice-Chair 2008-1012: Dr. Ray Cocco, ray.cocco@PSRICHicago.com, 773-523-7227
Immediate Past Chair 2006-2008: Dr. Shrikant Dhodapkar, sdhodapkar@dow.com, 979-238-7940
Secretary 2006-2008: Dr. Stephen Conway, Stephen-conway@merck.com, 215-652-6031
Treasurer 2006-2008: Professor Jennifer Sinclair Curtis, jcurtis@che.ufl.edu, 352-392-0882

Liaisons:
Academic 2008-2012: Professor Hamid Arastapoor, arastoopour@iit.edu, 312-567-3038
Academic 2008-2012: Professor Alissa Park, ap2622@columbia.edu, 212-854-8989
Academic 2006-2010: Professor Jennifer Sinclair Curtis, jcurtis@che.ufl.edu, 352-392-0882
Academic 2006-2010: Professor Joseph McCarthy, mccarthy@engr.pitt.edu, 412-624-7362
Industry 2008-2012: Dr. Greg Mehos, gregmehos@jenike.com, 978-649-3300
Industry 2008-2012: Dr. Stephen Conway, Stephen-conway@merck.com, 215-652-6031
Industry 2006-2010: Dr. Ecevit Bilgili, ecevit_bilgili@merck.com, 215-652-2821
Industry 2006-2010: George Fotou, george_fotou@cabot-corp.com, 505-563-4275
AIChE-CTOC: Professor Esin Gulari, egulari@chem1.Eng.Wayne.edu, 313-577-5767
AIChE Staff Associate: Ms. Nina Scatton, ninas@aiche.org, 203-702-7660

Standing Committees (Chairs):
Awards Committee 2006-2008: Professor Hugo S. Caram, hsc0@lehigh.edu, 610-758-4259
Education: Dr. Ralph D. Nelson, erptmgd@aol.com, 302-239-0409
Membership: Mark Bumiller/Hugo Caram, mark.bumiller@malvernusa.com, 508-480-0200, ext. 222/hsc0@lehigh.edu.edu, 610-758-4259
Newsletter Editor: Professor Christine Hrenya, hrenya@colorado.edu, 303-492-7689
Nominations: Professor Alan Weimer, weimera@colorado.edu, 303-492-3759
Recognition: Professor Sotiris Pratsinis, pratsinis@ivuk.mavt.ethz.ch, 41-1-632-3180
PF Organizational Information

Technical Programming Area Liaison and Group Chairs

The main focus of the PTF has been arranging for the extensive technical programs at the annual AIChE meeting in November. A lot of hard work goes into developing session themes, negotiating for sufficient time and reasonable scheduling of the sessions, attracting and screening papers, finding and training new session chairs, and making sure the whole process flows smoothly. Shrikant Dhodapkar, our Area 3 Liaison, attends an all-day session each January to plan the technical sessions at the Annual Congress and to arrange for co-sponsored sessions with other Divisions and Forums. Participation in this process is excellent training in and proof of management capabilities. The leaders selected this fall were

<table>
<thead>
<tr>
<th>Position</th>
<th>Person</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area 3 Liaison</td>
<td>Dr. Manuk Colakyan</td>
<td>The Dow Chemical Co.</td>
</tr>
<tr>
<td>Area 3 Vice Liaison</td>
<td>Dr. Shrikant Dhodapkar</td>
<td>The Dow Chemical Co.</td>
</tr>
</tbody>
</table>

**Group 3a – Particle Production and Characterization**
- Chair: Prof. M. Silvina Tomassone
- Vice-Chair: Dr. Ecevit Bilgili
  - Rutgers University
  - Merck and Company, Inc.

**Group 3b – Fluidization and Fluid-Particle Systems**
- Chair: Dr. Jesse Zhu
- Vice Chair: Reza Mostofi
  - Univ. of Western Ontario
  - UOP LLC

**Group 3c – Solids Flow, Handling, and Processing**
- Chair: Prof. Benjamin Glasser
- Vice Chair: Dr. Bruce Hook
  - Rutgers University
  - Dow Chemical

**Group 3d – Nanoparticles**
- Chair: Professor Yangchuan Xing
- Vice Chair: Gary Liu
  - University of Missouri-Rolla
  - DuPont

**Group 3e – Energetic Materials**
- Chair: Charles R. Painter
- Vice Chair: Jerry S. Salan
  - Department of the Navy
  - Naval Surface Warfare Center
From the Editor’s Desk

The *PTF Newsletter* is published twice a year as a vehicle for communication for all PTF members. PTF members are encouraged to send in news and information of general interest to PTF members. Please address your communication to

Professor Christine M. Hrenya  
Department of Chemical and Biological Engineering  
University of Colorado  
Boulder, CO 80309-0424  
Tel: (303) 492-7689; Fax: (303) 492-4341  
email: hrenya@colorado.edu

If you would prefer to continue receiving a hard copy of the newsletter instead of the electronic version, please send a note to this effect to the editor at the above address.

Advertisements may also be placed in the newsletter. The rates on a per issue basis are:

- 1/4 page $40
- 1/2 page $60
- Full page $110

Moving? New E-mail?

Help us get PTF news to your new address by filling in and e-mailing a change of address form. See the PTF web page at

[http://www.erpt.org/ptf/addrchng.txt](http://www.erpt.org/ptf/addrchng.txt)
Membership Information

Membership Application for the Particle Technology Forum, AIChE

CONTACT INFORMATION (print or type):
Name: ____________________________ Title: __________________
Category (check only one): AIChE Member ___ [# if you are a member = ________________]
Not an AIChE member _____
Company or University: __________________________
Address: __________________________
City: __________ State: _______ ZIP: ________ Country: __________
Work Phone: _______________________ FAX: ______________________
Email: ____________________________

MEMBERSHIP DUES (check only one line below) [Note that dues are for a calendar year]:
___ 15.00 $US for one year. Anyone use this option. For AIChE members dues will be listed on your AIChE dues invoice after your first year in PTF. Nonmembers don't receive a dues notice.
___ 75.00 $US for five years dues. Only nonmembers of AIChE are eligible for this option which is provided as a courtesy so that non-members won't have to send in five small checks.

METHOD OF PAYMENT (check and fill-in only one line below):
___ check (must be in $US on a U.S. bank or on a foreign bank with a New York City branch.) Make payable to Am. Inst. of Chem. Engineers. Mail with form to the address below.
___ money order (an international money order in $US is acceptable) Make payable to Am. Inst. of Chem. Engineers. Mail with form to the address below.
___ credit card (only VISA or MasterCard are accepted)
I agree to pay the amount checked-off above to the Am. Inst. of Chem. Engineers
3 Park Avenue, New York, NY 10016-5991, United States of America
according to the merchant agreement through my ___ VISA or my ___ MasterCard
Card Number: __________ / __________ / __________ / __________ Expiration Date __________ /
Cardholder's Signature __________________________ Date: __________
Cardholder's Daytime Telephone Number: __________________________
Print cardholder's name and address below if different from CONTACT INFORMATION:

______________________________
______________________________

Mail to the address below or FAX to (212)-591-8888 (in the United States)

AIChE, Particle Technology Forum
Document Processing
3 Park Avenue
New York, NY 10016-5991