Technical Program of the 45th
NORTH AMERICAN THERMAL ANALYSIS SOCIETY
CONFERENCE

August 6-9, 2018
Houston Hall – University of Pennsylvania
Philadelphia, Pennsylvania
### Monday, August 6, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>17:00-18:00</td>
<td>Opening Plenary Lecture: Prof. Ray H. Baughman (Auditorium)</td>
<td></td>
</tr>
<tr>
<td>18:00-21:00</td>
<td>Welcome Reception, Exhibition Opening, General &amp; Student Posters (Clayton Hall, Lobby)</td>
<td></td>
</tr>
</tbody>
</table>

### Tuesday, August 7, 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00-8:10</td>
<td>Opening Remarks (Auditorium)</td>
<td></td>
</tr>
<tr>
<td>8:10-8:55</td>
<td>Mettler Award Lecture: Dr. Janis Matisons (Auditorium)</td>
<td></td>
</tr>
<tr>
<td>8:55-9:00</td>
<td>Travel Break</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Room</th>
<th>Auditorium</th>
<th>Go/kin</th>
<th>Ben Franklin</th>
<th>Platt</th>
<th>Lynch Auditorium – Chemistry 1973 Building (Joint with Upenn Chem)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00-10:20</td>
<td>Honorary Session for Professor Wei-Ping Pan</td>
<td>Thermal Conductivity &amp; Advances in Instrumentation</td>
<td>Energetic Material &amp; Thermal Hazards</td>
<td>Additive Manufacturing</td>
<td>Glasses, Thin Films, &amp; Nanoconfinement</td>
</tr>
<tr>
<td>10:20-10:40</td>
<td>Break</td>
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<tr>
<td>10:40-12:00</td>
<td>Honorary Session for Professor Wei-Ping Pan</td>
<td>Thermal Conductivity &amp; Advances in Instrumentation</td>
<td>Energetic Material &amp; Thermal Hazards</td>
<td>Additive Manufacturing</td>
<td>Glasses, Thin Films, &amp; Nanoconfinement</td>
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<tr>
<td>12:00-13:30</td>
<td>Lunch Break</td>
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<tr>
<td>13:30-15:10</td>
<td>Honorary Session for Professor Wei-Ping Pan</td>
<td>Thermal Conductivity &amp; Advances in Instrumentation</td>
<td>Energetic Material &amp; Thermal Hazards</td>
<td>Silicone Polymers</td>
<td>Glasses, Thin Films, &amp; Nanoconfinement</td>
</tr>
<tr>
<td>15:30-17:30</td>
<td>General and Student Posters &amp; Exhibition (Bodek Lounge) – Poster Removal, 5 pm</td>
<td></td>
<td></td>
<td></td>
<td>Glasses, Thin Films, &amp; Nanoconfinement</td>
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### Wednesday, August 8, 2018

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<thead>
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<tbody>
<tr>
<td>8:00-8:10</td>
<td>Opening Remarks (Auditorium)</td>
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<tr>
<td>8:10-8:55</td>
<td>Plenary Lecture: Prof. Virgil Percec (Auditorium)</td>
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<tr>
<td>8:55-9:00</td>
<td>Travel Break</td>
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<thead>
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<th>Auditorium</th>
<th>Go/kin</th>
<th>Ben Franklin</th>
<th>Lynch Auditorium – Chemistry 1973 Building</th>
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</thead>
<tbody>
<tr>
<td>9:00-10:20</td>
<td>Kinetics</td>
<td>Pharmaceuticals &amp; Food Science</td>
<td>General Rheology &amp; Viscoelasticity &amp; Rheology of Powder</td>
<td>Glasses, Thin Films, &amp; Nanoconfinement &amp; Fast Scanning Calorimetry</td>
</tr>
<tr>
<td>10:20-10:40</td>
<td>Break</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10:40-12:00</td>
<td>Kinetics</td>
<td>Pharmaceuticals &amp; Food Science</td>
<td>General Rheology &amp; Viscoelasticity &amp; Rheology of Powder</td>
<td>Glasses, Thin Films, &amp; Nanoconfinement &amp; Fast Scanning Calorimetry</td>
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<tr>
<td>12:00-13:30</td>
<td>Lunch Break</td>
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<tr>
<td>13:30-14:30</td>
<td>Kinetics</td>
<td>Physical Properties of Polymers</td>
<td>General Rheology &amp; Viscoelasticity &amp; Rheology of Powder</td>
<td>Fast Scanning Calorimetry</td>
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<tr>
<td>14:30-14:50</td>
<td>Break</td>
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<td>15:50-16:05</td>
<td>Travel Break</td>
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<tr>
<td>16:05-17:05</td>
<td>NATAS Business Meeting (Auditorium)</td>
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<tr>
<td>18:30-20:00</td>
<td>Banquet (Bodek Lounge)</td>
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<tr>
<td>20:00-21:00</td>
<td>NATAS Awards (Bodek Lounge)</td>
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### Thursday, August 10, 2018

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<tr>
<td>8:00-8:10</td>
<td>Opening Comments (Auditorium)</td>
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<tr>
<td>8:10-8:55</td>
<td>Plenary Lecture, Prof. Raymond Gorte (Auditorium)</td>
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<tr>
<td>8:50-9:00</td>
<td>Travel Break</td>
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<tbody>
<tr>
<td>9:00-10:20</td>
<td>Honorary Session for Patrick Gallagher &amp; General Session 1</td>
<td>Sustainable Materials and Green Chemistry</td>
<td>General Session 2 &amp; Metals and Ceramics</td>
<td>Biopolymers and Biomaterials</td>
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<tr>
<td>10:20-10:40</td>
<td>Break</td>
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<tr>
<td>10:40-12:00</td>
<td>Honorary Session for Patrick Gallagher &amp; General Session 1</td>
<td>Sustainable Materials and Green Chemistry</td>
<td>General Session 2 &amp; Metals and Ceramics</td>
<td>Biopolymers and Biomaterials</td>
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</table>

**End of Conference**
TECHNICAL PROGRAM OF THE 45TH
NORTH AMERICAN THERMAL ANALYSIS SOCIETY
CONFERENCE

August 6-9, 2018

Houston Hall – University of Pennsylvania
Philadelphia, Pennsylvania

Conference Chair
Andrew McGhie
University of Pennsylvania

Technical Program Chair
Xiao Hu
Rowan University

Award Chair
Andrew McGhie
University of Pennsylvania

Exhibition Chair
Tina Adams
The Lubrizol Corporation

Proceedings Chair
Elizabeth Pelczar
Innophos, Inc.

Short Course Chair
Sara Reynaud
Arkema

NATAS Staff Management
Greg Jewell
AEC Management Resources

The photographing or recording of any talk or poster without the author’s consent is prohibited.
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<td>2017 NATAS Conference Committee</td>
<td>14</td>
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<tr>
<td>The 44th Annual Conference on Thermal Analysis and Applications</td>
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<tr>
<td>Author Index</td>
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<td>Inside back cover</td>
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The photographing or recording of any talk or poster without the author’s consent is prohibited.
Welcome to Philadelphia and the 45th Annual Conference of the North American Thermal Analysis Society (NATAS). I hope, while you are here, that you have a chance to enjoy the beautiful urban campus of the University of Pennsylvania, and the historic city of Philadelphia, the birthplace of American independence. There are exciting things to see and do, including visits to Independence Hall, the Liberty Bell, and the Betsy Ross House. And, you probably should satisfy your hunger at least once with a famous Philly cheesesteak.

The founder of the University of Pennsylvania, Benjamin Franklin, was one of America’s earliest scientists, making contributions to optics (bifocals), electricity, batteries, the lightning rod, and the Franklin stove, which would radiate heat from the middle of the room in all directions – perhaps his own early contribution to what would become thermal analysis.

Franklin’s maxim “well-done is better than well-said” captures the essence of the hard work and planning of this year’s conference committee. Our Conference Chair and Awards Chair, Andrew McGhie (University of Pennsylvania); Technical Program Chair, Xiao Hu (Rowan University); Exhibition Chair, Tina Adams (Lubrizol Corp); Proceedings Chair, Elizabeth Pelczar (Innophos); and Short Course Chair, Sara Reynaud (Arkema) have worked hard to put together a great meeting, with outstanding plenary and keynote lectures, parallel technical sessions each day, a general and student poster session, and awards banquet. The conference would not be possible without the dedication of these volunteers. I personally thank them and the other NATAS volunteers and support staff, for their hard work and dedication to the society.

Each year, the conference includes a vendor exhibition where attendees can see the newest thermal analysis instruments, software, and support products. We are grateful to our exhibitors, without whom this conference and this society would not be possible, and their multiple forms of support (from conference presentations, lunches, receptions, and joint advertising) help to make NATAS the great society that it is. Please, set aside some time to visit the exhibition booths. You will find it well worth the time invested.

As you enjoy the conference, I hope you will consider becoming active in the society as a volunteer. We are always looking for capable and committed people to help improve NATAS to better serve our members. For 45 years, NATAS has been the society at the forefront of thermal analysis, which continues as an important interdisciplinary branch of science with applications spanning fields as diverse as pharmaceuticals, life-sciences, nano-materials, and energetic materials. Thermal analysis is central in much of our professional lives, and your talents and contributions to the society would be welcome. Enjoy the conference, and don’t hesitate to contact me at Michael.R.Kessler@ndsu.edu.

Michael Kessler
NATAS 2018 President
# NATAS 2018 Conference – Technical Session Organizers

<table>
<thead>
<tr>
<th>Session</th>
<th>Session Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honorary Symposium for Patrick Gallagher on the Occasion of His 85th Birthday</td>
<td>Blaine Weddle, Mettler Toledo&lt;br&gt;Ted Charsley, University of Huddersfield</td>
</tr>
<tr>
<td>Honorary Symposium for Wei-Ping Pan on His Retirement</td>
<td>Chi-Min Shu, Yuntech&lt;br&gt;Tao Wang, North China Electric Power University (NCEPU)</td>
</tr>
<tr>
<td>Advances in Instrumentation</td>
<td>Nelson Garci, H.E.L.&lt;br&gt;Yaritza Sanchez, T.A.I.</td>
</tr>
<tr>
<td>Additive Manufacturing</td>
<td>Eric Schoch, Northrop Grumman</td>
</tr>
<tr>
<td>Fast Scan Calorimetry</td>
<td>Yung P. Koh, Texas Tech University&lt;br&gt;Sindee Simon, Texas Tech University</td>
</tr>
<tr>
<td>Glasses, Thin Films, and Nanoconfinement</td>
<td>Zahra Fakhraai, University of Pennsylvania&lt;br&gt;Subarna Samanta, University of Pennsylvania</td>
</tr>
<tr>
<td>Physical Properties of Polymers</td>
<td>Joe Menczel, Retired</td>
</tr>
<tr>
<td>Silicone Polymers</td>
<td>Janis Matisons, Silar Inc&lt;br&gt;Jeffrey Kelly, Dow</td>
</tr>
<tr>
<td>General Rheology and Viscoelasticity</td>
<td>Ran Tao, NIST</td>
</tr>
<tr>
<td>Rheology of Powders</td>
<td>Sara Reynaud, Arkema</td>
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<tr>
<td>Rheology of Fibers</td>
<td>Steve Sauerbrunn, University of Delaware</td>
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<tr>
<td>Food Science</td>
<td>Michael Tunick, Drexel University</td>
</tr>
<tr>
<td>Wood Science and Technology</td>
<td>Bob Howell, Central Michigan Univ</td>
</tr>
<tr>
<td>Metals and Ceramics</td>
<td>Andrew McGhie, University of Pennsylvania</td>
</tr>
<tr>
<td>Biopolymers and Biomaterials</td>
<td>David Salas, Rutgers University</td>
</tr>
<tr>
<td>Session</td>
<td>Session Chair</td>
</tr>
<tr>
<td>-------------------------------</td>
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</tbody>
</table>
| Pharmaceuticals               | Marc Ilies, Temple University  
Rachel Forcino, Glaxo Smith Kline                                           |
| Kinetics                      | Bertrand Roduit, AKTS                                                         |
| Energetic Materials & Thermal Hazards | Queenie Kwok, NRC, Canada  
Libby Glascoe, Lawrence Livermore N.L.                                       |
| Thermal Conductivity          | Adam Harris, C-Therm                                                         |
| Sustainable Materials and Green Chemistry | Joe Stanzione, Rowan University                                           |
| General Session               | Sarah Ackermann, TAL                                                          |
| Student Posters               | Tina Adams, Lubrizol                                                          |
| General Posters               | Tina Adams, Lubrizol                                                          |
2018 NATAS Conference Exhibitors

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Phone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKTS AG, Advanced Kinetics and Technology Solutions</td>
<td>TECHNOArk 1</td>
<td>+4 1 (0) 848 800 221</td>
<td><a href="http://www.akts.com">www.akts.com</a></td>
</tr>
<tr>
<td></td>
<td>3960 Siders</td>
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<tr>
<td></td>
<td>Switzerland</td>
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<tr>
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<td>+4 1 (0) 848 800 221</td>
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<td><a href="http://www.akts.com">www.akts.com</a></td>
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<tr>
<td>Frontier Lab</td>
<td>5141 Lone Tree Way</td>
<td>925-813-0498</td>
<td><a href="http://www.frontier-lab.com">www.frontier-lab.com</a></td>
</tr>
<tr>
<td></td>
<td>Antioch, CA 94531</td>
<td></td>
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<tr>
<td>Hitachi High Technologies America, Inc.</td>
<td>1375 North 28th Avenue</td>
<td>972-615-9000</td>
<td><a href="http://www.hitachi-hightech.com">www.hitachi-hightech.com</a></td>
</tr>
<tr>
<td></td>
<td>P.O. Box 612208</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dallas, TX 75261-2208</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrument Specialists, Inc.</td>
<td>133 E. Main Street</td>
<td>262-877-3600</td>
<td><a href="http://www.instrument-specialists.com">www.instrument-specialists.com</a></td>
</tr>
<tr>
<td></td>
<td>Twin Lakes, WI 53181-0280</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mettler-Toledo, LLC</td>
<td>1900 Polaris Parkway</td>
<td>800-638-8537</td>
<td><a href="http://www.mt.com">www.mt.com</a></td>
</tr>
<tr>
<td></td>
<td>Columbus, OH 43240</td>
<td></td>
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<tr>
<td>NETZSCH Instruments North America, LLC</td>
<td>129 Middlesex Turnpike</td>
<td>781-272-5353</td>
<td><a href="http://www.netzsch-thermal-analysis.com">www.netzsch-thermal-analysis.com</a></td>
</tr>
<tr>
<td></td>
<td>Burlington, MA 01803</td>
<td></td>
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<tr>
<td>SETARAM, Inc.</td>
<td>Valley Business Park</td>
<td>844-4-SETARAM</td>
<td><a href="http://www.us.setaram.com">www.us.setaram.com</a></td>
</tr>
<tr>
<td></td>
<td>216 State Highway 206, Suite 22</td>
<td>908-262-7060</td>
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<td></td>
<td>Hillsborough, NJ 08844</td>
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<td>Thermtest Inc.</td>
<td>34 Melissa Street, Unit 1</td>
<td>506-458-5350</td>
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<td>Fredericton, NB E3A 6W1</td>
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2018 Award Winners

**Mettler Award in Thermal Analysis**
(sponsored by Mettler-Toledo)

`Janis Matisons`
Silar

**NATAS Fellow**
(sponsored by Netzsch Instruments, N.A. LLC)

`Nobuyoshi Koga`
Hiroshima University

**NATAS Outstanding Service Award**
(sponsored by Netzsch Instruments N.A. LLC)

`Joseph Menczel`
Retired

**NATAS Best Student Paper Award**
(Sponsored by SETARAM)

`Tatsiana Liavitskaya`, University of Alabama
*Kinetics of thermal polymerization can be studied during continuous cooling*

`Nazam Sakib`, Texas Tech University
*Thermal and rheological analysis of polystyrene-grafted silica nanocomposite: Effect of graft length on absolute heat capacity and rubbery plateau modulus*

**NATAS Student Travel Award**
(sponsored by NATAS)

`Milad Ahmadi Khoshooei`, University of Calgary
`Madhu Pallaka`, Texas Tech University
`Victoria Stanford`, University of Alabama
`Qian Tian`, Texas Tech University

Special Award ($250)
`Yi-Hung Chung`, National Yunlin University

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TAFDV Student Travel Award

Post-docs
Ivan Souza, Rowan University
Silvio Curia, Rowan University

Graduate Students
Jordan Aguirre, Temple University
Sanaz Bandegi, Temple University
Birane Fall, Temple University
Sarah Gleeson, Drexel University
Mark Staub, Drexel University
Minxue Shi, Rowan University
Ye Xue, Rowan University

Undergraduate Students
Morgan Hesser, Drexel University
Joseph Perrotta, Rowan University
## Previous Award Winners

<table>
<thead>
<tr>
<th>Mettler Award in Thermal Analysis</th>
<th>NATAS Outstanding Service Award</th>
</tr>
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<tbody>
<tr>
<td>2017 C-M. Shu</td>
<td>2017 S. Sauerbrunn</td>
</tr>
<tr>
<td>2016 A. Toda</td>
<td>2016 T. Adams</td>
</tr>
<tr>
<td>2015 R. Chartoff</td>
<td>2015 Q. Kwok</td>
</tr>
<tr>
<td>2014 S. Simon</td>
<td>2014 M. LaTorre</td>
</tr>
<tr>
<td>2013 P. Cebe</td>
<td>2013 B. Howell</td>
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<tr>
<td>2012 B. Howell</td>
<td>2012 S. Simon</td>
</tr>
<tr>
<td>2011 A. McGhie</td>
<td>2011 M. Varma-Nair</td>
</tr>
<tr>
<td>2008 W.-P. Pan</td>
<td>2008 D. E. G. Jones</td>
</tr>
<tr>
<td>2007 E. L. Charsley</td>
<td>2008 T. S. Ramotowksi</td>
</tr>
<tr>
<td>2006 C. E. Schick</td>
<td>2007 M. J. Rich</td>
</tr>
<tr>
<td>2005 D. J. W. Grant</td>
<td>2006 W. Hammetter</td>
</tr>
<tr>
<td>2004 S. Vyazovkin</td>
<td>2005 L. Judovits</td>
</tr>
<tr>
<td>2003 G. Delia Gatta</td>
<td>2004 W. P. Pan</td>
</tr>
<tr>
<td>2002 V. Mathot</td>
<td>2003 D. Burlett</td>
</tr>
<tr>
<td>2001 G. McKenna</td>
<td>2002 B. Wunderlich</td>
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<tr>
<td>2000 M. Reading</td>
<td>2001 C. M. Earnest</td>
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<td>1999 S. Cheng</td>
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<td>1998 A. Riga</td>
<td>1999 S. Dyszel</td>
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<td>1997 Y. Kanna</td>
<td>1998 S. Mikhail</td>
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<td>1996 M. E. Brown</td>
<td>1997 M. Keating</td>
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<td>1995 J. C. Seferis</td>
<td>1996 J. Enns</td>
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<td>1994 S. St. John Warne</td>
<td>1995 A. Riga</td>
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<td>1993 Y. Godovsky</td>
<td>1994 L. Boyter</td>
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<td>1992 H. Starkweather</td>
<td>1993 B. Bachman</td>
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<td>1990 V. Balek</td>
<td>1991 R. Hutchinson</td>
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<td>1989 R. B. Prime</td>
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<td>1987 H. Bair</td>
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<td>1984 L. Mandelkern</td>
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<td>1983 R. S. Porter</td>
<td>1984 J. J. Mauer</td>
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## Previous Award Winners

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<th>Year</th>
<th>Name 1</th>
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<td>G. McKenna</td>
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hu@rowan.edu

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Plenary Lecture
Monday, August 6, 2018
17:10 – 18:00
Auditorium

Stronger, faster, and more powerful thermal and electrochemical artificial muscle yarns and fibers

Ray Baughman
Director, Alan G. MacDiarmid NanoTech Institute
University of Texas, Dallas
Ray.Baughman@utdallas.edu

ABSTRACT

Successive generations of artificial muscle yarns and fibers have provided the understanding needed to progressively increase muscle performance. While our original electrochemical muscles based on carbon nanotube (CNT) sheets provided only about 0.1% tensile strokes, our present coiled yarn electrochemical CNT muscles provide tensile strokes as high as 12%, and 65 times the work capacity per cycle and 100 times the load-lifting capability as the same size natural muscle. Our polymer muscles made from fishing line or sewing thread, which are thermally, electrothermally, or chemically powered, can rotate at 100,000 rpm, contract 49%, generate 5 times the gravimetric power of a car engine, lift 100 times heavier loads than the same length and weight human muscle, or actuate at 7.5 cycles/s for millions of cycles. The strokes of these polymer muscles has been increased to a remarkable 9000% for applications as diverse as thermal energy harvesting and comfort-adjusting clothing. We have very recently shown that our CNT muscles can be operated in reverse to generate a gravimetric electrical power output that is higher than for any reported mechanical energy harvester for few Hz to 600 Hz frequencies. These “twistron” harvesters were used in the ocean to harvest wave energy, combined with thermally-driven artificial muscles to convert temperature fluctuations to electrical energy, sewn into textiles for use as self-powered respiration sensors, and used to power a LED and to charge a storage capacitor.

BIOGRAPHY

Ray Baughman became the Robert A. Welch Professor of Chemistry and Director of the NanoTech Institute at the University of Texas in Dallas in August 2001, after 31 years in industry. He is a member of the National Academy of Engineering, the Academy of Medicine, Engineering and Science of Texas, the Academia Europaea, and the European Academy of Sciences and Arts; a foreign member of the European Academy of Sciences; a Fellow of the Royal Society of Chemistry, the National Academy of Inventors, and the American Physical Society; an
Academician of The Russian Academy of Natural Sciences; an honorary professor of 7 universities in China; and is on editorial or advisory boards of *Science* and other journals. Ray has 89 issued US patents and 415 refereed publications, with over 36,150 citations and a Web of Science H-index of 84.
Thermal analysis in addressing materials problems: A personal journey

Janis Matisons
Silar
jmatisons@silar.com

ABSTRACT

We have entered the modern nanomaterials age. New advanced materials have fundamentally transformed our life style forever and made a vast world into a global village. What kinds of materials lie ahead in our future? This “Designed Materials Age” that we are in requires new knowledge to build advanced materials. I will look at the way thermal analysis has helped me develop new materials within an Australian context, where industry has partnered with me in academia to develop new materials, solve complex materials problems and launch new commercial products.

Thermal analysis instrumentation underwent considerable development during the late 90’s, as did many analytical techniques, and this has greatly helped our understanding of materials properties, and more importantly in developing better commercial products. I will look at several commercial examples my team has been involved with and how these examples not only illustrate the development of thermal analysis, but also of new career pathways for staff and students involved in such collaborative ventures.

As time permits project involving new plastic lenses, highly filled elastomers, perfectly alternating copolymers, engine oils and coatings for cork will be shown.

BIOGRAPHY

Professor Janis Matisons joined Silar in 2016 as its Vice President. This marks the second stage in his return to industry, where he began his early research career (Sola, Bramite, Flexichem). Prior to joining Silar he was the Senior R&D Manager at Gelest Inc. Before returning to industry, he was appointed as the first Australian professorial chair in nanotechnology at Flinders University, where he formed and lead the Nanomaterials Group for 9 years. He has been involved in applied chemical research since 1976 specialising in materials, polymer and silicon-based research. He was the Chief and Founding Editor of
the journal, Silicon Chemistry (now Silicon) and is now the Chief and Founding Editor of the book series Advances in Silicon Science, published by Springer. He has also published over 400 scientific, technical and conference articles, participated in 28 major joint industry-academic collaborative grants resulting in over two dozen patents, the formation of 2 spin off companies, and the launch of 79 products into the marketplace.

Professor Janis Matisons moved to Flinders University from the University of South Australia where he led the research of the Polymer Science Group at the Ian Wark Research Institute. The Polymer Science Group, grew to become Australia’s largest polymer research group in 2000. His research interests have covered a broad spectrum of research disciplines; from the awarding of the William Culross prize for his early research in organometallic chemistry at Adelaide University, to the Royal Australian Chemical Institute’s Polymer Citation for excellence in silicon research and education. He is a longstanding member of the American Chemical Society and a fellow of the Royal Australian Chemical Institute. He was organized several international and national meetings, the most recent being the 18th ISOS International Silicon Symposium in Shandong China in August 2017. He was awarded the Royal Australian Chemical Institute’s highest prize for applied research, the Applied Research Medal in 2008.
Leading and misleading morphological studies mediated by combinations of methods including thermal analysis

Virgil Percec
University of Pennsylvania
percec@sas.upenn.edu

ABSTRACT

Thermal analysis methodologies including DSC represent the standard structural and morphological analysis technique employed to detect and interpret first order phase transitions that most commonly are used to identify changes between different structural polymorphs. This lecture will describe classic examples in which DSC is indeed successfully employed to detect and identify enantiotropic, monotropic and virtual first order transitions and interpret the structure and morphologies involved in these processes. The same DSC technique will be shown to mislead the detection of first order phase transitions that ultimately can lead to very important structural and morphological discoveries by a more complex combination of methodologies including in addition to DSC also variable temperature solid state $^3$H-NMR and X-ray diffraction.

BIOGRAPHY

Virgil Percec’s list of awards includes Honorary Foreign Member of the Romanian Academy (1993), Humboldt Award for Senior US Scientists (1997), NSF Research Award for Creativity in Research (1990, 1995, 2000), Fellow of IUPAC (2001), PTN Polymer Award from the Netherlands (2002), Fellow of PMSE Division of ACS (2003), Fellow of the American Association for the Advancement of Science (2004), the ACS Award in Polymer Chemistry (2004), the Staudinger Medal from ETH (2005), Doctor Honoris Causa from Polytechnic University, Iasi (2007) and University of Athens, Greece (2007), the International Award of the Society of Polymer Science, Japan (2007), the H.F. Mark Medal from the Austrian Institute for Science and Technology, Vienna (2008), Honorary Member of the Israel Chemical Society (2009), Humboldt Award for Senior US Scientists (2011), the ACS Inaugural Kavli Foundation Innovation in Chemistry Lecture (2011), Honorary Professor of the Australian Institute of Bioengineering & Nanoscience, Foreign Member of the Royal Swedish Academy of Engineering Sciences (2013), Honorary member and “Petru Poni” Medal of the Romanian Chemical Society (2014), Cristofor Simionescu ACS Award for excellence in Macromolecular

He is Editor of Thermochimica Acta and has served as Editor of the Journal of Polymer Science Part A Polymer Chemistry (1996-2013), of the book series Liquid Crystals (2007-2013), and currently is Editor of Advances in Polymer Science (2013-). Currently, he is on the Editorial and Advisory Boards of 22 International Journals, on the Scientific Advisory Boards of several Companies, National Laboratories and of the Australian Institute for Bioengineering & Nanoscience. He is a consultant to numerous US and International Companies and Governmental Offices. He was ranked by Thomson Reuters as one of the “World’s Most Influential Scientific Minds” for the years 2014, 2015, and 2016.

His research interest is at the interface between organic, supramolecular, macromolecular chemistries, liquid crystals, nanoscience and biology where he contributed over 750 refereed publications, 80 patents, edited 19 books and presented over 1200 endowed, invited and plenary lectures. His h-index is 99 (in Web of Science) and 106 (in Google Scholar).
Plenary Lecture

Thursday, August 9, 2018
8:10 – 8:50 am
Auditorium

Catalysts for endothermic reforming of hydrocarbon fuels

Yu-Hao Yeh and Raymond J. Gorte
University of Pennsylvania
gorte@seas.upenn.edu

ABSTRACT

A major challenge associated with hypersonic aircraft is thermal protection of the engine, since air cooling is not possible at high velocities. An approach that has been used for controlling the temperatures of critical engine components in the US Air Force X-51A program involves using the fuel itself as a coolant before it enters the combustion chamber. While the amount of heat that can be taken up by the fuel is limited by the maximum temperature to which the fuel can be heated, it is possible to increase the cooling capacity of the fuel by performing endothermic reactions on it. Two possible reactions that have been investigated in this work are the acid-catalyzed cracking reactions that occur in acidic zeolites and the aromatization reactions that occur over Ga- and Zn-exchanged zeolites.

Initial work at Penn focused on supercritical, high-pressure reactions of n-hexane over H-ZSM-5, with and without the addition of Pt, Ga, or Zn, and determined reaction endothermicities from the product distributions. For unpromoted H-ZSM-5, the product distribution indicated that the endothermicity is low and decreases with increasing pressure. The addition of Ga or Zn to H-ZSM-5 significantly increased the endothermicity of the reactions by increasing the selectivity to form small aromatics. By contrast, the addition of Pt had a minor effect on both the rate and product distribution. Adsorption studies aimed at understanding the role of Zn in H(Zn)ZSM-5 showed that at low ion-exchange levels, less than 0.5 Zn/Al, each Zn cation displaced one Brønsted-acid site. FTIR of adsorbed acetonitrile-d3 and calorimetric measurements of adsorbed CO at 195 K indicated that the exchanged Zn cations form Lewis-acid centers. A model in which the Zn cations, acting as Lewis-acid centers, polarize intermediates formed at Brønsted sites provided a way of understanding the observations.

The heat flows associated with conversion of n-hexane on H-ZSM-5 and H(Zn)-ZSM-5 were also measured directly for reaction at 60 bar and both 673 and 773 K. The acid-catalyzed reactions over H-ZSM-5 were found to be only mildly endothermic (<10 kJ/mol) at low conversions and exothermic at all conversions above 50%. The reactions on H(Zn)-ZSM-5 were significantly more endothermic (40 to 50 kJ/mol) for conversions below 70%; however, the reactions also became exothermic at very high conversions. Measurements of the product distributions showed that the reaction endothermicity for H(Zn)-ZSM-5 at lower conversions was likely due to formation of significant amounts of benzene,
toluene, and xylene but that these were converted to higher molecular weight products at high conversions.

**BIOGRAPHY**

Raymond J. Gorte joined the faculty at the University of Pennsylvania in 1981 after receiving his PhD in Chemical Engineering from the University of Minnesota. He is currently the Russell Pearce and Elizabeth Crimian Heuer Professor of Chemical & Biomolecular Engineering, with a secondary appointment in Materials Science & Engineering. Since joining Penn, Ray has served as Chairman of Chemical Engineering from 1995 to 2000 and was the Carl V. S. Patterson Professor of Chemical Engineering from 1996 through 2001. He received the 1997 Parravano Award of the Michigan Catalysis Society, the 1998 Philadelphia Catalysis Club Award, the 1999 Paul Emmett Award of the North American Catalysis Society, the 2001 Penn Engineering Distinguished Research Award, the 2009 AIChE Wilhelm Award, and was elected to the National Academy of Engineering in 2018. He has served as Chairman of the Gordon Conference on Catalysis (1998) and Program Chairman of the 12th International Zeolite Conference (1998). He is an Associate Editor of the Journal of the Electrochemical Society. His present research interests are focused on electrodes for solid-oxide fuel cells, catalyst synthesis by ALD, and catalysts for biomass upgrading. He is also known for his research on zeolite acidity and on the redox properties of ceria for catalysis.
Monday, August 6, 2018

**Plenary Lecture**
Auditorium

17:00–17:10  Opening remarks  
*Leslie Laird Kruhly*, Vice-President and University Secretary

17:10–18:00  Stronger, faster, and more powerful thermal and electrochemical artificial muscle yarns and fibers  
*Ray Baughman* (*University of Texas, Dallas*)

**Welcome Reception, Exhibition Opening, General Poster Session, and Student Poster Session**

**Student Poster Session**
Bodek Lounge  
18:00 to 21:00

**General Poster Session**
Bodek Lounge

*Tina Adams, Lubrizol (Session Chair)*

New catalysts for the highly efficient combustion of solid rocket motorpropellant  
*Cesar Morales* (*Universidad Mayor*), *Paula Povea*, *Juan Arroyo*, *María Belén Camarada*, *Juan Manuel Manriquez*

Comparison of rheometer and mechanical testing by TTS evaluation and correlation in composite propellants and explosives  
*Ayse Hande Calis* (*Roketsan Missiles Incorporation*), *Gozde Saritas*

Copper nanoparticles supported on PAMAM dendrimers as burning rate catalyst of composite solid propellants  
*Maria Belén Camarada* (*Camarada*), *Paula Povea*, *Paulina Rios*, *Cesar Morales*

Thermal decomposition and thermally induced carbonation of calcium hydroxide  
*Nobuyoshi Koga* (*Hiroshima University*), *Satoki Kodani*

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Evaluating temperature dependence of local mechanical property by temperature variable AFM
Yuichi Kasai (Hitachi High-Technologies Science America, Inc.), Masayuki Iwasa, Shinya Kudo, Kazunari Ando, Hirohisa Yoshida

Cloud point measurement of oil using sample observation DSC
Yuichi Kasai (Hitachi High-Technologies Science America, Inc.), Yoshikazu Nishiyama

Characterizing active particle-excipient interactions using thermal analysis and microscopy
Stephanie Lam (GlaxoSmithKline), Rachel Forcino

Rheological behavior of wheat protein with commercial gluten product using small and large strain
Pavalee Chompooarat, Patricia Rayas-Duarte (Oklahoma State University), Zorba J. Hernández-Estrada

Thermal stability assessment of reactive systems
Ling Yang (Intertek)

Fiber orientation evaluation of cellulose nanofiber-containing material by fiber orientation identification system applying thermal diffusivity anisotropy measurement
Kimihito Hatori (Bethel Co., Ltd.), Takaaki Awano, Tetsuya Ohtsuki, Yoshihiko Kido, Kojiro Uetani, Hosei Nagano

Use of high temperature drop-calorimetry techniques to study thermodynamic properties of inorganic materials
Andrea Ternyila (Setaram, Inc.)
Student Poster Session
Bodek Lounge
Tina Adams, Lubrizol (Session Chair)

Computational fluid dynamics approach to study thermal decomposition of cumene hydroperoxide
Shunyao Wang (Nanjing University of Science and Technology), Chen Wanghua, Guo Zichao

A study of classifying autocatalytic strength with adiabatic conditions
Ze Dong (Nanjing University of Science & Technology), Hui Qian, Chen Wanghua, Chen Liping

Numerical simulation and experimental study on venting behaviors of di-tertbutyl peroxide in pressure vessel
Xu Peng (Nanjing University of Science and Technology), Chen Liping, Chen Wanghua

Simulation studies of decomposition kinetics and thermal hazards of Hexamethylenetetramine by DSC and ARC
Jun Zhang (Nanjing University of Science and Technology), Sen Yang, Wei Feng, Wanghua Chen, Liping Chen, Guoning Rao

Electrospray preparation and properties of the composites based on CL-20
Yong Xu Wang (Nanjing University of Science and Technology), Bin Li, Jian Yao

Study on thermodynamic properties of nitrous oxide fuel blends by oxygen-bomb calorimeter and PHI-TECII
Yuyan Li (Nanjing University of Science and Technology), Sen Xu, Feng Pan, Lifeng Xie

Adsorption studies on mesoporous carbon using a thermogravimetric method
Lucas Hynes (University of Ontario Institute of Technology), Donna Riel, Dario Bonetta, Liliana Trevani

Thermal stability of pharmaceuticals dissolved in solid polyvinylpyrrolidone matrix
Yasmine Ben Osman, Tatsiana Liavitskaya (University of Alabama at Birmingham), Sergey Vyazovkin

Thermal stability analysis of benzotriazole as an additive in lithium-ion batteries
Guan-Ting Chen, Yi-Hong Chung (National Yunlin University of Science and Technology), Jhao-Min Jiang, Yih-Wen Wang, Chi-Min Shu

Dust explosion characteristics and inhibiting effect of suppressant for nitrocellulose
Hao-Cyun Huang, Yi-Hong Chung (National Yunlin University of Science and Technology), Yun-Ting Tsai, Chi-Min Shu

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Hydrolysis of cellulose to produce bio-ethanol via ionic liquid catalysis
Yu-Wen Hong, Wei-Cheng Lin, Shang-Hao Liu, Chi-Min Shu (National Yunlin University of Science and Technology)

Thermal analysis of various polymers through thermogravimetric analysis and differential scanning calorimetry for medical implant use
Alan Riga, Jiongcheng Lou (Case Western Reserve University), Sharmila Iyer, Jonathan Petrozzini

Thermal hazards of benzoyl peroxide and its related process products through theoretical thermodynamics and differential calorimetric technology
Bin Laiwang, Shang-Hao Liu, Chi-Min Shu (National Yunlin University of Science and Technology)

Focused laser spike dewetting as a tool for the rapid kinetic study of metallic glass
Tianxing Ma (Rutgers University), Jonathan Singer, Sebastian Kube, Jan Schroers

Phase transition study of lipid bilayer with flavin mononucleotide using differential scanning calorimetry
Poornima Kalyanram (Rochester Institute Of Technology), Anju Gupta

TAFDV Award: Effect of pan type and period for modulated DSC
Morgan Hesser (Drexel University), Lawrence Judovits

TAFDV Award: Novel silica-compatibilized solid hybrid electrolytes for all solid lithium metal batteries
Jordan Aguirre (Temple University), Stephanie Wunder

TAFDV Award: Silk-soy protein biocomposite materials
Joseph Perrotta (Rowan University), Xiao Hu
Tuesday, August 7, 2018

METTLER Award in Thermal Analysis – Plenary Lecture
Sponsored by Mettler Toledo

Auditorium

8:00–8:10  Opening remarks

8:10–8:55  Thermal analysis in addressing materials problems: A personal journey
          *Keynote speaker: J. Matisons (Silar)  PL-2

Honorary Session for Wei-Ping Pan on his Retirement
Auditorium

Prof. Chi-Min Shu, Yuntech & Prof. Tao Wang, North China Electric Power University (NCEPU)
(Session Chairs)

9:00–9:40  A transient process simulation on thermal explosion of propylene recovery
          reactor linked with calorimetric techniques
          *Keynote speaker: Yi-Hong Chung, Jhao-Min Jiang, Chi-Min Shu (National
          Yunlin University of Science and Technology)  WP-1

          Adsorptive removal of mercury by biochar modified with plasma
          9:40–10:00  Tao Wang (North China Electric Power University), Yongsheng Zhang, Wei-
          Yin Chen, Wei-Ping Pan  WP-2

          VOC-adsorption and desorption properties of charcoals, woodceramics
          and fry ash prepared from woody biomass
          10:00-10:20  Yuko Nishimoto (Kanagawa University)  WP-3

10:20-10:40  Break

10:40-11:20  Kinetic approach to multistep reactions in solid-gas systems: Practical
             examples
             *Keynote speaker: Nobuyoshi Koga (Hiroshima University)  WP-4

11:20-11:40  Physical stability of amorphous drug with structurally related impurities
             evaluated using thermal analysis
             *Etsuo Yonemochi (Hoshi University)  WP-5

The photographing or recording of any talk or poster without the author’s consent is prohibited.
11:40-12:00 Development and application on highly time and spatially resolved characterization techniques for burning cigarette status
Bin Li (Zhengzhou Tobacco Research Institute of CNTC)
WP-6

12:00-13:30 Lunch Break

13:30-14:10 Thermal decomposition of poly(styrene)
*Keynote speaker: Bob A. Howell (Central Michigan University)
WP-7

14:10-14:30 Analysis of carbon pellets and tobacco smoldering in eclipse cigarettes by the oxygen consumption method and the CO/CO2 generation method
Ke Zhang (Zhengzhou Tobacco Research Institute of CNTC), Jing Wang, Le Wang, Nan Deng, Mingjian Zhang, Bin Li, Duanfeng Lu
WP-8

14:10-14:30 Thermal and rheological comparison of adhesives for naval shipbuilding
Barbara Sanchez-Silva, Ana-Maria Diaz-Diaz, Javier Tarro-Saavedra, Jorge Lopez-Beceiro, Carlos Gracia-Fernandez, Ramon Artiaga (University of A Corua)
WP-9

14:30-14:50 Application of phase equilibrium theory in the heat-transfer process’s analysis of heat-not-burn tobacco cigarettes
Le Wang (Zhengzhou Tobacco Research Institute of CNTC), Mingjian Zhang, Ke Zhang, Nan Deng, Duanfeng Lu, Bin Li
WP-10

Thermal Conductivity & Advances in Instrumentation
Golkin

Adam Harris, C-Therm (Session Chair – Thermal Conductivity)

9:00–9:20 A circular heat source (CHS): A novel method for measurement of thermal transport properties of anisotropic (orthotropic) materials
Michael Emanuel (C-Therm Technologies), Maha Bhouri, Dominic Groulx, Jesse Maassen
TC-1

Measuring “cooling power”: Characterization of “cool touch” foams exhibiting inhomogeneous thermal properties using a transient plane source instrument
Andrey Soukhojak (The Dow Chemical Company), Tammy Fowler, Yasmin Srivastava
TC-2

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9:40–10:00  Sensors for fluid thermal conductivity measurements using the transient hot-wire method
*Sofia Mylona* (*Thermtest Inc.*), *Eric May*  
TC-3

10:00–10:20  **TAFDV Award**: Lithium ionic conduction in crystalline adiponitrile2LiPF6
*Birane Fall* (*Temple University*)  
TC-4

10:20–10:40  **Break**

10:40–11:00  Recent development of specific heat measurements of large-size composite samples: Variable-size test chamber and numerical simulations
*Besira Mekonnen Mihiretie*, *Dale Hume* (*Thermtest Inc.*), *Mattias Gustavsson*, *Andrey Sizov*, *Ma Yi*, *Daniel Cederkrantz*, *Bitnoori Lee*  
TC-5

11:00–11:20  Reinventing differential scanning calorimetry
*Alexander Makitka III* (*Linseis*)  
AI-1

11:20–11:40  Temperature effects on thermal effusivity calibration materials
*Roger Blaine* (retired)  
AI-2

11:40–12:00  A new high pressure TGA instrument based on the magnetic suspension balance technology
*Thomas Paschke* (*TA Instruments*), *Frieder Dreisbach*, *Cornelia Wil*  
AI-3

12:00–13:30  **Lunch Break**

*Rojin Belganeh* (*Frontier Lab*), *Terry Ramus*, *Robert Freeman*, *Rogoberto Advincula*, *Itsuko Iwai*  
AI-4

13:50–14:10  Heat of combustion of polymer decomposition products
*Richard Walters* (*Federal Aviation Aministration*), *Richard E. Lyon*  
AI-5

14:10–14:30  A high throughput thermal properties tester from room temperature to 2800°C
*Justin Wynn* (*TA Instruments*), *Heng Wang*  
AI-6

14:30–14:50  High temperature heat capacity measurements by MDSC
*Jason Saienga* (*TA Instruments*)  
AI-7

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14:50-15:10  Process optimization for ceramics production  
*Elena Moukhina (NETZSCH Geraetebau GmbH)*  

*Nelson Garci, H.E.L. & Yaritza Sanchez, T.A.I. (Session Chairs – Advances in Instrumentation)*

**Energetic Materials and Thermal Hazards**  
*Ben Franklin*

*Queenie Kwok, NRC, Canada & Libby Glascoe, Lawrence Livermore N.L. (Session Chairs)*

9:00-9:20  LLNL chemical reactivity test (CRT) compatibility approaches  
*Ginger Guillen (Lawrence Livermore National Laboratory)*  

9:20-9:40  A simple question with complex answers; is nitroglycerine compatible with boron potassium nitrate or not?  
*Ruth Tunnell (QinetiQ), Dave Tod, Roz Dale, Ian King, Mark Ashcroft*  

9:40-10:00  Chemical characterization of thermal and radiative damaged TATB  
*Elizabeth Glascoe (Lawrence Livermore National Laboratory), Joseph Zaug, Keith Coffee, Greg Klunder, Benjamin Yancey, Patrick Allen*  

10:00-10:20  Boron/potassium nitrate microspheres fabricated by electrostatic spraying and their burning characteristic as pyrotechnic initiator  
*Yanchun Li (Nanjing University of Science and Technology), Qian Zhong*  

10:20-10:40  Break

10:40-11:00  Reactions of metal oxides and metal halogenates  
*Jimmie Oxley (University of Rhode Island), James Smith, Athina Kominia*  

11:00-11:20  Origin of very high reactivity of aluminum-iodate-hexa-hydrate (AIH)  
*Sanjoy Bhattacharia (Texas Tech University), Michelle Pantoya, Dylan Smith*

**NATAS Special Student Award:** A review on critical aspects of lithium-ion battery overcharge  
*Yi-Hong Chung (National Yunlin University of Science and Technology), Chi-Min Shu, Yih-Wen Wang*  

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11:40-12:00  Test study for pellet to clad interaction in CFR600 design

Yan Peng (China Institute of Atomic Energy)  EM-8

12:00-13:30  Lunch Break

13:30-13:50  Identifying autocatalytic decomposition reactions using model-free kinetics for process safety

Han Xia (Eli Lilly and Company), Stanley Kolis  EM-9

13:50-14:10  The kinetics of the solid-liquid phase change of TNT based energetic materials

Benjamin Yancey (Lawrence Livermore National Laboratory), Jennifer Montgomery, Victoria Stanford, Elizabeth Glascoe, Octavio Cervantes  EM-10

14:10-14:30  Hazards characterization of energetic ionic liquids

Queenie Kwok (NRCan Canadian Explosives Research Laboratory), Jonathan Lavoie, Richard Turcotte, Shanti Singh  EM-11

14:30-14:50  Thermal behavior and safety assessment of diammonium 5,5’-bistetrazole-1,1’-diolate (ABTOX)

Junfeng Wang (Beijing Institute of Technology), Shusen Chen, Kun Chen, Qinghai Shu  EM-12

14:50-15:10  Thermal hazard analysis of dihydroxylammonium 5,5’-bistetrazole-1,1’-diolate (TKX-50)

Hu Niu (Beijing Institute of Technology), Shusen Chen, Shaohua Jin, Qinghai Shu  EM-13

**Additive Manufacturing**

**Platt**

Eric Schoch, Northrop Grumman (Session Chair)

9:00-9:40  3D printing nanocomposite polymers and their thermo-mechanical characterization

*Keynote speaker: Rogoberto Advincula (Case Western Reserve University)*  AM-1

**TAFDV Award:** Synthesis and characterization of epoxy-methacrylate bisphenolic resin for thermoset applications and additive manufacturing

Joseph Stanzione, John La Scala, Ivan da Silva Souza (Rowan University)  AM-2

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10:00-10:20  
**Polymer powders ageing characterization in additive manufacturing**  
Quentin Ribeyre, Geoffroy Lumay, Filip Francqui (GranuTools)  

10:20-10:40  
**Break**

10:40-11:00  
Methods to investigate SLA resins and the state of currently available resins  
Joseph Stanzione, John La Scala, Kevin Andrews (Rowan University)  

11:00-11:20  
Thermal analysis of the effect of thermal processing on powder Al alloys used in additive manufacturing  
Caitlin Walde (WPI), Danielle Cote, Victor Champagne, Richard Sisson  

11:20-11:40  
Thermal analysis of additively manufactured AM205 aluminum alloy produced by laser - powder bed fusion  
Kevin Chasse, Karl Schoch, Amanda Brocki (Northrop Grumman Corporation)  

**Silicone Polymers**  
**Platt**  
Janis Matisons, Silar Inc & Jeffrey Kelly, Dow  
(Session Chairs)

13:30-13:50  
The unique world of siloxanes  
Janis Matisons (Silar)  

13:50-14:10  
The analytical chemistry of silicones  
Lesley-Ann O'Hare (The Dow Chemical Company)  

14:10-14:30  
High frequency properties of elastomeric silicones and engineered nanocomposites  
Sharath Sriram (RMIT University)
Glasses, Thin Films, and Nanoconfinement 1:  
[Joint with Upenn Dept. of Chemistry]  
Lynch Auditorium – Chemistry 1973 Building  

Zahra Fakhraai, University of Pennsylvania & Subarna Samanta, University of Pennsylvania  
(Session Chairs)

9:00-9:40  
Using anisotropic vapor deposited glasses to learn about the structure and mobility of liquid surfaces  
*Keynote speaker: Mark Ediger (University of Wisconsin-Madison)  

9:40-10:00  
Effects of microstructure formation on the stability of vapor deposited glasses  
Alex Moore (University of Pennsylvania), Patrick Walsh, Zahra Fakhraai, Robert Riggleman  

10:00-10:20  
Surface diffusion study in thin glassy films of small organic molecules  
Subarna Samanta (University of Pennsylvania), Zahra Fakhraai, Yue Zhang, Patrick Walsh, Georgia Huang  

10:20-10:40  
Break

10:40-11:20  
Coupling fast scanning nanocalorimetry with physical vapor deposition to explore new phenomena  
*Keynote speaker: Marta Gonzalez-Silveira (Universitat Autonoma de Barcelona), Ana Vila, Joan Ràfols-Ribé, Josep Lluís Tamarit, Javier Rodriguez-Viejo  

11:20-12:00  
Orientation in amorphous materials for electronics applications: An industry perspective  
*Keynote speaker: Kenneth Kearns (Dow Chemical)  

12:00-13:30  
Lunch Break

13:30-14:10  
Testing the behavior of glass-forming materials: Thermo-viscoelastic measurements on nano- to micro-gram quantities of materials  
*Keynote speaker: Gregory McKenna (Texas Tech University), Heedong Yoon
14:10-14:30 Fragility and its relationship with heat capacity, Tg, molecular weight and crosslink density for polycyanurates
*Evelyn Lopez (Texas Tech University), Yung P. Koh, Sindee Simon*

14:30-14:50 Correlations between short- and long-time relaxations in supercooled colloidal liquids and glasses
*Chandan K Mishra (University of Pennsylvania), Xiaoguang Ma, Piotr Habdas, Arjun Yodh*

14:50-15:10 NATAS Student Travel Award: Influence of β relaxation on isothermal structural recovery using KAHR model
*Qian Tian (Texas Tech University), Sindee Simon*

15:10-15:30 Excess entropy scaling law in quasi-two-dimensional “attractive” colloidal fluids
*Xiaoguang Ma (University of Pennsylvania), Jiachen Liu, Yikang Zhang, Piotr Habdas, Arjun Yodh*

15:50-16:10 Effects of confinement on glass transition temperature in polymer films and nanocomposites: What are the effects and their origin and how can they be suppressed or eliminated?
*John Torkelson (Northwestern University)*

16:10-16:30 The effect of extreme spatial confinement and interfacial interactions on the glass transition of polymers in polymer-infiltrated nanoparticle packings
*Haonan Wang (University of Pennsylvania), Jyo Lyn Hor, Daeyeon Lee, Zahra Fakhraai*

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**General and Student Posters & Exhibition**

**Bodek Lounge**

**15:15-17:00**

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Wednesday, August 8, 2018

Plenary Lecture
Auditorium

8:00–8:10 Opening remarks

Leading and misleading morphological studies mediated by combinations of methods including thermal analysis

Virgil Percec (University of Pennsylvania)

Pharmaceuticals & Food Science
Golkin

Marc Ilies, Temple University & Rachel Forcino, Glaxo Smith Kline (Session Chairs - Pharmaceuticals)
Michael Tunick, Drexel University (Session Chair – Food Science)

9:00-9:40 Exploring solid state hydration of crystalline organics: Understanding the observed Negative Activation Energy
*Keynote speaker: Jeff Brum (GlaxoSmithKline), Rachel Forcino, Pete Skrdla

Application of thermal analysis to study the impact of gamma irradiation on a pharmaceutical suspension

Rachel Forcino (GlaxoSmithKline)

Heat capacity and enthalpy of crystalline and amorphous indapamide

Marek Pyda (Rzeszow University of Technology), Marcin Skotnicki, Agata Drogon

10:20-10:40 Break

Thermal analysis of PEGylated conjugates and their supramolecular assemblies as drug delivery systems

Utpal Mondal (Temple University School of Pharmacy), Stephanie Wunder, Marc Ilies

Thermogravimetric - fourier transform infra-red [TG-FTIR] investigation of a pediatric formulation of a pharmaceutical drug containing sucralose

Philippa Elefante (GSK)

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The photographing or recording of any talk or poster without the author’s consent is prohibited.

11:20-11:40   **TAFDV Award**: Chain length and headgroup dependence of phase separation in mixed vesicles of DiA and phospholipids

*Sanaz Bandegi (Temple University), Marc Ilies, Stephanie Wunder*

Ash content and overall composition analysis of common flours using a TGA procedure

*Jelizaveta Poloz (University of Guelph), Jayne Bock, Dmitriy V Soldatov*

12:00-13:30   Lunch Break

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**Glasses, Thin Films, and Nanoconfinement 2 & Fast Scan Scanning Calorimetry**

*Lynch Auditorium*

**Zahra Fakhraai, University of Pennsylvania & Subarna Samanta, University of Pennsylvania**
*(Session Chairs – Glasses, Thin Films, and Nanoconfinement)*

&

**Yung P. Koh, Texas Tech University & Sindee Simon, Texas Tech University**
*(Session Chairs – Fast Scanning Calorimetry)*

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9:00-9:40   Uncovering factors that alter the local glass transition near polymer interfaces

*Keynote speaker: Connie Roth (Emory University)*

9:40-10:00  Focused laser spike dewetting for metrology of thin films

*Jonathan Singer, Tianxing Ma (Rutgers University)*

10:00-10:20 "Spin" dynamics in buckled and frustrated quasi-two-dimensional colloidal crystals

*Analisa Hill (University of Pennsylvania), Xiaoguang Ma, Arjun Yodh*

10:20-10:40 Break

10:40-11:00 Water based laminating adhesive loaded with flame retardant

*Wenxiao Sun (Henkel Corporation), James Nowicki*

11:00-11:20 Polymerization and crystallization kinetics of nanoconfined PLLA

*Haoyu Zhao (Texas Tech University), Sindee Simon*
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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</table>
| 11:20-11:40 | Using rapid chip calorimetry to investigate nano-gram quantities of material  
Gregory McKenna (Texas Tech University), Heedong Yoon, Nabila Shamim, Amer El Banna, Yung P. Koh, Sindee Simon |
| 11:40-12:00 | Enthalpy recovery of ultrathin polystyrene film using flash DSC  
Yung P. Koh, Sindee Simon (Texas Tech University) |
| 12:00-13:30 | Lunch Break                                                                                       |
| 13:30-14:10 | Morphology and thermal properties of semi-crystalline polymer films by slow deposition  
*Keynote speaker: Rodney Priestley (Princeton University)* |
| 14:10-14:30 | The influence of clarifiers on the crystallization of polypropylene at high supercooling  
J.E.K. Schawe (Mettler-Toledo) |
| 14:30-14:50 | Break                                                                                             |
| 14:50-15:10 | Sample coverage and temperature distribution in nanocalorimetry measurements  
Feng Yi (National Institute of Standards and Technology), Lawrence Friedman, Emanuel Franke, Richard Chen, Volkert Cynthia, David LaVan |
| 15:10-15:30 | Crystallization of flow-induced precursors in polyamides at low and high supercooling  
Alicyn Rhoades (Penn State Behrend), Anne Gohn, Jiho Seo, René Androsch, Ralph Colby |
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker and Details</th>
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</thead>
</table>
| 9:00-9:40| Use of chemical kinetics for modeling petroleum systems  
*Keynote speaker: Alan Burnham (Stanford University)* | Kin-1  |
| 9:40-10:00| **SETARAM Student Award:** Kinetics of thermal polymerization can be studied during continuous cooling  
*Tatsiana Liavitskaya (University of Alabama at Birmingham), Sergey Vyazovkin* | Kin-2  |
| 10:00-10:20| A new isoconversional hypothesis and kinetic free method  
*Jo Dweck (Rio de Janeiro Federal University)* | Kin-3  |
| 10:20-10:40| **Break**                                    | Kin-4  |
| 10:40-11:00| Reactants-induced dynamic responses of the surface of heterogeneous catalysts monitored by microcalorimetry beyond adsorption  
*Sabine Wrabetz (Fritz-Haber-Institut der Max-Planck-Gesellschaft)* | Kin-5  |
| 11:00-11:20| Isokinetics  
*Richard E. Lyon (Federal Aviation Administration)* | Kin-6  |
| 11:20-11:40| Specificity of kinetic modelling and process optimization for curing reactions  
*Elena Moukhina (NETZSCH Geraetebau GmbH)* | Kin-7  |
| 11:40-12:00| The power of kinetics simulations: application of data loggers in monitoring shelf-life of materials  
*Bertrand Roduit (AKTS AG), Marco Hartmann, Patrick Folly, Alexandre Sarbach, Alain Dejeaifve, Rowan Dobson* | Kin-8  |
<p>| 12:00-13:30| <strong>Lunch Break</strong>                             | Kin-9  |</p>
<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
</tr>
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<tbody>
<tr>
<td>13:30-13:50</td>
<td>Thermal behavior of quasi-autocatalytically decomposed solids: How phase transitions, melting and sample mass can influence the experimental workflow</td>
<td><em>Bertrand Roduit (AKTS AG), Marco Hartmann, Patrick Folly, Alexandre Sarbach, Alain Dejeaifve, Rowan Dobson, Kenneth Kurko</em></td>
</tr>
<tr>
<td>13:50-14:10</td>
<td><strong>NATAS Student Travel Award:</strong> Thermal decomposition kinetics of malonic acid in the condensed phase</td>
<td><em>Victoria Stanford (University of Alabama at Birmingham), Sergey Vyazovkin</em></td>
</tr>
<tr>
<td>14:10-14:30</td>
<td>Thermal analysis of soil organic matter bioenergetics</td>
<td><em>Elizabeth Williams (University of Pennsylvania), Alain Plante</em></td>
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<td>14:30-14:50</td>
<td><strong>Break</strong></td>
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<tr>
<td>14:50-15:10</td>
<td>Compensation effect: Sublimation, polymer degradation, diffusion in polymers</td>
<td><em>Vadim Krongauz (ICU Medical, Inc.)</em></td>
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<tr>
<td>15:10-15:30</td>
<td><strong>NATAS Student Travel Award:</strong> Reaction kinetics of nanoconfined linear epoxy polymerization: A DSC study</td>
<td><em>Madhusudhan Reddy Pallaka (Texas Tech University), Sindee Simon</em></td>
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<tr>
<td>15:30-15:50</td>
<td>Kinetics of the combustion of residual sulfur filtration cakes generated in sulfuric acid units</td>
<td><em>Jo Dweck (Rio de Janeiro Federal University), Roberto Carvalho, Daniel Costa, Eduardo I L Paz</em></td>
</tr>
</tbody>
</table>
General Rheology and Viscoelasticity & Rheology of Powders

Rheology of Powders Session sponsored by Freeman Technology

Ben Franklin

Ran Tao, NIST (Session Chair – General Rheology and Viscoelasticity)
Sara Reynaud, Arkema (Session Chair – Rheology of Powders)

9:00-9:20
Gluten and dough rheology, protein composition and its relationship with breadmaking quality of wheat
Zorba J. Hernández-Estrada, Patricia Rayas-Duarte (Oklahoma State University)

9:20-9:40
The application of rheology in pressure sensitive adhesives
Ben Xu (Avery Dennison), Neerali Desai

9:40-10:00
Characterization of viscoelasticity in coating systems
Anand Atmuri (PPG Industries), Reza Rock

10:00-10:20
Rheology of shear thickening fluids
Ran Tao (National Institute of Standards and Technology), Aaron Forster, Sejal Shah

10:20-10:40
Break

SETARAM Student Award: Thermal and rheological analysis of polystyrene-grafted silica nanocomposite: Effect of graft length on absolute heat capacity and rubbery plateau modulus
Nazam Sakib (Texas Tech University), Yung P. Koh, Sindee Simon

10:40-11:00
Practical considerations for generating master curves using time-temperature superposition (TTS)
Yash Adhia (TA instruments - Waters llc)

11:00-11:20
Synthesis and mechanical characterization of ambient-dried and hydrophobic poly(isocyanurate-urethane) aerogels
Sadeq Malakooti (The University of Texas at Dallas), Rostami Saman, Habel G. Churu, Huiyang Luo, Jenna Clark, Fabiola Casarez, Owen Rettenmaier, Soheil Daryadel, Majid Minary-Jolandan, Chariklia Sotiriou-Leventis, Nicholas Leventis, Hongbing Lu

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11:40-13:30  **Lunch Break**

13:30-13:50  **Linear rheology of a series of supersoft glass-formers**  
Zhiyuan Qian, Yung P. Koh, Alice Chang, Tzu-Pin Lin, Pablo Guzman, Robert Grubbs, Sindee Simon, Gregory McKenna (Texas Tech University)  

Multiscale characterization of polymer dynamics in carbon nanotube grafted fiber-reinforced polymer composites  
**Ajay Krishnamurthy (National Institute of Standards and Technology), Ran Tao, Erkan Senses, Sagar Doshi, Erik Thostenson, Antonio Faraone, Aaron Forster**  

14:10-14:30  **Characterization of magnetorheological fluids**  
Sarah Cotts (TA Instruments), Bharath Rajaram, Tianhong Chen, Alina Latshaw  

13:50-14:10  **Multiscale characterization of polymer dynamics in carbon nanotube grafted fiber-reinforced polymer composites**  
**Ajay Krishnamurthy (National Institute of Standards and Technology), Ran Tao, Erkan Senses, Sagar Doshi, Erik Thostenson, Antonio Faraone, Aaron Forster**  

14:30-14:50  **Break**

14:30-15:10  **Rheological assessment of the effect of particle size and distribution on the cohesive strength of dry powders**  
Chuck Rohn (Malvern Instruments)  

14:50-15:10  **Rheological assessment of the effect of particle size and distribution on the cohesive strength of dry powders**  
Chuck Rohn (Malvern Instruments)  

15:10-15:30  **Fluidized bed rheology for granular media**  
Abhishek Shetty (Anton Paar USA)  

14:30-15:10  **Rheological assessment of the effect of particle size and distribution on the cohesive strength of dry powders**  
Chuck Rohn (Malvern Instruments)  

15:10-15:30  **Fluidized bed rheology for granular media**  
Abhishek Shetty (Anton Paar USA)  

15:30-15:50  **Powder flowability study to optimize mixing and predict final product properties: A study on PVC formulations**  
Laura Nebel (Arkema), Sara Reynaud, Mark Lavach  

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Physical Properties of Polymers
Golkin

Joe Menczel, Retired (Session Chair)

13:30-13:50 Phase transformation in polyvinylidene fluoride nanocomposites by using nanoparticles of stannous sulfate
*Gautam Jaiswar (Dr. Bhimrao Ambedkar University Agra)*

13:50-14:10 Polymers with extraordinarily broad glass transition regions and utility as broad-T-range damping materials: Designing nanophase separation with broad interphases in gradient copolymers and segmented polyhydroxyurethanes and thiol-norbornene polymers
*John Torkelson (Northwestern University)*

14:10-14:30 TAFDV Award: Structural disorder and edgeless melting in spherical poly (L-lactic acid) crystals
*Mark Staub (Drexel University), Christopher Li*

14:30-14:50 Break

14:50-15:10 Evaluation of anisotropic thermal diffusivity for resin sheet by a laser spot periodic heating radiation thermometry method
*Kimihito Hatori (Bethel Co., Ltd.), Takaaki Awano, Chikako Kobayashi, Yoshihiko Kido, Tsuyoshi Nishi, Hiromichi Ohta*

15:10-15:30 Thermal transitions in liquid crystalline polymers
*Joseph Menczel (Thermal Measurements LLC)*

15:30-15:50 A comparison between apparent melting and thermodynamic melting on polymers
*Yaritza Sanchez Gil (TA Instruments)*
NATAS Business Meeting
Auditorium
16:05-17:05

Banquet
Bodek Lounge
18:30-20:00

NATAS Awards
Bodek Lounge
20:00-21:00
Thursday, August 9, 2018

Plenary Lecture
Auditorium

8:00–8:10  Closing comments

8:10–8:50  Catalysts for endothermic reforming of hydrocarbon fuels
Raymond Gorte (University of Pennsylvania), Yu-Hao Yeh  PL-4

Honorary Symposium for Patrick Gallagher on the Occasion of His 85th Birthday & General Session 1
Auditorium

Blaine Weddle, Mettler Toledo & Ted Charsley, University of Huddersfield
(Session Chairs - Honorary Symposium for Patrick Gallagher)
Sarah Ackermann, TAL (Session Chair – General Session)

Netzsch NATAS Fellowship Award: Impact of evolved gas on the reaction
kinetics in inorganic solid–gas systems
Nobuyoshi Koga (Hiroshima University)  PG-1

9:00-9:40  Fast scanning calorimetry up to 1000°C: New possibilities for investigating
fast processes in inorganic materials
Blaine J. Weddle (Mettler-Toledo)  PG-2

9:40-10:00  Thermal stability of vinylidene chloride polymers
Bob A. Howell (Central Michigan University)  PG-3

10:00-10:20  Break

10:20-10:40  Zone refining- the forgotten purification technique: Application to NMR
studies in organic solids
Andrew McGhie (University of Pennsylvania), Gilbert Sloan  PG-4

10:40-11:00  Thermal analysis of phase change materials - Three organic waxes using
DSC, modulated DSC, TGA, and modulated TGA
Yue Schuman (TA Instruments)  GS-1

The photographing or recording of any talk or poster without the author’s consent is prohibited.
**NATAS Student Travel Award:** A critical review on the application of differential scanning calorimetry (DSC) to petroleum fluid characterization: Characterization and phase behavior

*Milad Ahmadi Khoshooei (University of Calgary), Farhad Fazlollahi, Yadollah Maham, Pedro Pereira Almao*

**11:40-12:00**

Electroactive fluoropolymers

*Lawrence Judovits (Arkema Inc.)*

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**Sustainable Materials and Green Chemistry**

*Ben Franklin*

**Joe Stanzione, Rowan University (Session Chair)**

**9:00-9:20**

Sustainable recycling of cross-linked polymers and composites: Turning cross-linked polymers into thermoplastics during high-temperature reprocessing and back into cross-linked polymers at low temperature

*John Torkelson (Northwestern University)*

**9:20-9:40**

Advancement of bio-based polymers and composites for military applications: Pushing the envelope via strategic assemblies of xylochemicals

*Joseph Stanzione (Rowan University), John La Scala, Giuseppe Palmese, Joshua Sadler*

**9:40-10:00**

Investigation of ammonia gas sorption on heat-treated struvite using STA-PTA-FTIR

*Marlon Ramlogan (Rutgers University), Ashaki Rouff, Alon Rabinovich, Dayana Arrue*

**10:00-10:20**

Towards sustainable high-performance thermoplastics: Synthesis, characterization and enzymatic hydrolysis of bisguaiaol-based polyesters

*Joseph Stanzione, Silvio Curia (Rowan University), Barry Satterfield, Antonino Biundo, Georg Gubitz*

**10:20-10:40**

Break
TAFDV Award: Preparation and characterization of bio-based polyesters derived from food chain by-products

Joseph Stanzione, Ivan da Silva Souza (Rowan University), Nicholas Coposky, Silvio Curia

SMGC-5

TAFDV Award: Kinetic study of novel nanoporous PDVB - based catalysts for the synthesis of a bio-based bisphenol

Joseph Stanzione, Minxue Shi (Rowan University), Iman Noshadi

SMGC-6

General Session 2 & Metals and Ceramics

Griski

Sarah Ackermann, TAL (Session Chair – General Session)
Andrew McGhie, University of Pennsylvania (Session Chair – Metals and Ceramics)

9:00-9:20 Thermal properties of metal tris-acetylacetonates at low and high temperatures

Janusz Grebowicz (University of Houston-Downtown (UHD))

MC-1

9:20-9:40 Pool boiling enhancement mechanisms in multi scaled carbon-based morphologies

Aniket Rishi (Rochester Institute of Technology), Anju Gupta, Satish Kandlikar

GS-4

9:40-10:00 Impact of iodine treatment on the thermal combusion of activated carbon

Steven Hardwick, Nathan Kirk (W.L. Gore & Associates, Inc.), Perry Spevack, Eiko Nakamaru-Ogiso

GS-5

10:00-10:20 New theory and applications of quantitative analysis

Hongde Xia (Institute of Engineering Thermophysics, Chinese Academy of Science)

GS-6

10:20-10:40 Break

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Quantitative analysis of simultaneous multicomponent evolved gases in TG-MS
Kai Wei (Institute of Engineering Thermophysics, Chinese Academy of Science) GS-7

Simple quantitative analysis by TGA/MS
James Browne (TA Instruments), Louis Waguespack GS-8

A numerical study of heat transfer and fluid flow in an array of pin fins in aligned and staggered configurations
Johnny Issa (University of Balamand), Najib Saliba, Amina El Cheikh GS-9

Investigations in secondary reactions of evolved gases by TG-MS with a skimmer integrated coupling system
Qian Huang (Institute of Engineering Thermophysics, Chinese Academy of Science) GS-10

**Biopolymers and Biomaterials**

**Golkin**

David Salas, Rutgers University (Session Chair)

Thermal stability of carboxyl-terminal glycerol/adipic acid hyperbranched poly(ester)s end-capped with diaminoplumium(II) moieties
Uyen Huynh (Central Michigan University), Bob Howell BB-1

**TAFDV Award:** Hierarchical polymer fibers for synthetic bone scaffolds
Sarah Gleeson (Drexel University), Tony Yu, Michele Marcolongo, Christopher Li BB-2

The effect of coagulation agent upon the structure and thermal properties of cellulose/silk bio-composites
David Salas de la Cruz (Rutgers University), David Verrill, Stacy Love BB-3

Thermal degradation of phosphorus esters of 1,4-butanediol and 2-butyn-1,4-diol
Eric Ostrander (Central Michigan University), Bob Howell BB-4

Break 10:20-10:40

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10:40-11:00  **TAFDV Award**: Silk-based magnetic composite materials
*Ye Xue (Rowan University), Xiao Hu*

11:00-11:20  Charring plasticizers from biobased 3,5-dihydroxybenzoic acid
*Eric Ostrander (Central Michigan University), Bob Howel*

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End of Conference

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Map to Houston Hall and Chemistry 1973 Building
Houston Hall

First Floor

- Bodek Lounge
- Class of 1966 Reading Room
- Info Ctr
- Bistro
- Hall of Flags
- Balcony
- La Petite Chez

Second Floor

- Bishop White Room
- Office of Student Life
- Second Floor Lobby
- Class of 1949 Auditorium
- Ben Franklin Room
- Golkin Room
- Rabinowitz Room
- Brachfeld Meeting Room
- Platt Rehearsal Room

Third Floor

- Rain Family Room
- Gruksi Room
- Class of 1947 Room
- Morris Setz Memorial Room
- Perlman Quadrangle Office