

## 42<sup>nd</sup> IPS Seminar Daily Agenda

Monday, 7/11/2016

8:00 a.m. Introductory Remarks – Dr. Gregory D. Knowlton (President, IPSUSA Seminars, Inc.)

8:10 a.m. Welcome – Prof. Lori Groven & Dr. Anthony Shaw (Co-Chairs)

**Session A:                   New Directions in Energetics Processing**  
**Session Chairs:         Dr. Zac Doorenbos & Dr. Joost van Lingen**

8:20 a.m. **KEYNOTE ADDRESS – Mr. Jerry Salan,**  
**CEO, Nalas Engineering Services, Inc. (USA)**  
*Engineering Next- Generation Green Pyrotechnics*

9:10 a.m. *Continuous Processing of Energetic Materials*  
Peter Lucon (USA)

9:30 a.m. *The Performance Modification of Aluminum Nanothermites using*  
*ResonantAcoustic® Mixing*  
David G. Kelly, Pascal Beland, Patrick Brousseau, Catalin-Florin Petre (CANADA)

9:50 a.m. *A New Technique for Making Pyrotechnics*  
K. Smit, M. Morgan, R. Pietrobon, A. Lee (AUSTRALIA)

BREAK 10:10 a.m. – 10:40 a.m. POSTERS

**Session B:                   Applications of Energetics Processing**  
**Session Chairs:         Dr. Zac Doorenbos & Dr. Joost van Lingen**

10:40 a.m. *Chemical Gas Generators Based on Mechanically Alloyed Reactive Materials*  
Sergio E. Guerrero, Marco A. Machado, Daniel A. Rodriguez, Edward L. Dreizin,  
Evgeny Shafirovich (USA)

11:00 a.m. *Investigation of Structure/Behavior Relationships in Metallized Explosives*  
Robert V. Reeves, Alexander E. Gash, Kyle T. Sullivan (USA)

11:20 a.m. *Investigation of Flame Jump in Rapidly Reacting Porous Silicon*  
Nicholas Piekiele, Christopher Morris (USA)

11:40 a.m. *Processing of Milled Aluminum, Silicon, and Aluminum-Silicon Nanocomposites for*  
*Pyrotechnic Applications*  
L. A. Morris, C. Haines, Z. Doorenbos, M. Puszynski, J. Puszynski (USA)

LUNCH – 12:00 p.m. – 1:15 p.m.

**Session C:                   Engineered Energetic Materials I**  
**Session Chairs:         Dr. Jesse Sabatini & Dr. Magdalena Rusan**

1:20 p.m. **INVITED SPEAKER – Prof. Steven Son,**  
**Purdue University, School of Mechanical Engineering (USA)**  
*Engineered Particles for Improved Propellants and Their Characterization*

2:10 p.m. Impact Ignition Threshold and Combustion Performance of Nano-Structured Reactive  
Materials  
Phillip Martellaro, Edward S. Siccardi Jr, Steven Thoma, Gregory Knowlton,  
Bernard Kosowski (USA)

- 2:30 p.m. *3D Co-Printing of Multiple Pyrotechnic Materials with Novel Geometries*  
Christopher Williams, Alice Kerbein (USA)
- 2:50 p.m. *New Strategies for Reducing the Mechanical Sensitivity of CL-20 with Reserved High Energy*  
Zhijian Yang, Ling Ding, Fude Nie (CHINA)

BREAK 3:10 p.m. – 3:40 p.m. POSTERS

**Session D: Engineered Energetic Materials II**  
**Session Chairs: Dr. Jesse Sabatini & Dr. Magdalena Rusan**

- 3:40 p.m. *Estimation of Burning Mechanism of Some Azodicarbonamide/Ammonium Nitrate/Copper (II) Oxide Mixtures*  
K. Ikeda, S. Date, A. Doi, Y. Okumura, A. Tanaka (JAPAN)
- 4:00 p.m. *Smart Energetics: Harnessing Piezoelectric Behaviour*  
Sara L. Row, Josh Koenig, Lori J. Groven (USA)
- 4:20 p.m. *Preparation of an Aqueous Nanothermite Inks for Micro Charging in Solid Propellant Microthruster*  
Jianbing Xu, Yinghua Ye, Yun Shen, Chengbo Ru, Ruiqi Shen, Peng Zhu (CHINA)
- 4:40 p.m. *Tracer Conundrum: Achieving Longer Range with Less Pyrotechnic Charge*  
Christopher M. Csernica (USA)
- 5:00 p.m. *3D Printing of Multi-Core Propellant Grains with Integral Structural Elements*  
Alice Kerbein, Christopher Williams (USA)

6:00 p.m. to 9:00 p.m. – Casual Mixer in the DoubleTree's Peachtree Terrace (Outdoors)  
*Everyone is invited; including children, friends, etc.*

Tuesday, 7/12/2016

**Session E: Nanoenergetics**  
**Session Chairs: Dr. Trevor Griffiths & Dr. Jared Moretti**

- 8:00 a.m. **INVITED SPEAKER – Dr. Denis Spitzer**  
**Director, NS3E Research Laboratory (FRANCE)**  
*Continuous and Reactive Nanocrystallisation: New Concepts and New Processes to Design Energetic Materials for Technological Breakthrough*
- 8:50 a.m. *Investigation of the Impact Initiation of a Secondary Explosive by the Combustion of Nano-Energetic Materials*  
Ludovic Glavier, Fabien Jouot, Laurent Renaud, Bernard Martin, Ludovic Salvagnac, Carole Rossi (FRANCE)
- 9:10 a.m. *Hybrid Nanothermites: Energetic Materials for Cutting-Edge Applications*  
Marc Comet, Cédric Martin, Martin Klaumünzer, Fabien Schnell, Denis Spitzer (FRANCE)
- 9:30 a.m. *Design, Realization and Characterization of Several Types of Micro-Initiators Integrating Al/CuO Nanothermite: Role of Metallic Micro-Heater and Substrate on Fire/No Fire Characteristics*  
Andréa Nicollet, Sandrine Souleille, Ludovic Glavier, Laurent Mazonq, Ludovic Salvagnac, Carole Rossi (FRANCE)

BREAK 9:50 a.m. – 10:20 a.m. POSTERS

**Session F:                    Synthesis and Technology Initiatives**  
**Session Chairs:            Dr. Trevor Griffiths & Dr. Jared Moretti**

- 10:20 a.m. *Synthesis and Investigation of the Novel Thermally Stable Explosive: TKX-55*  
Thomas M. Klapötke, Tomasz G. Witkowski (GERMANY)
- 10:40 a.m. *Synthesis and Properties of Dual-Use Nitrate Ester Energetic Materials*  
Jesse J. Sabatini, Leah A. Wingard, Eric C. Johnson (USA)
- 11:00 a.m. *JIMTP Strategy and Path Forward*  
Anthony Di Stasio (USA)
- 11:20 a.m. *U.S. Army Pyrotechnic Technology Initiatives (From Legacy to Leap Ahead)*  
James Wejsa, Andrew Zimmer (USA)

**Group Photo & Lunch 11:40 a.m. – 1:15 p.m.**

**Session G:                    Environmental Aspects I**  
**Session Chairs:            Dr. David Dye & Dr. Girish Srinivas**

- 1:20 p.m. **INVITED SPEAKER – Dr. Karl Oyler**  
**US Army ARDEC (USA)**  
*Lead-Free Primary Explosives Development and Beyond*
- 2:10 p.m. *Perchlorate Particulate Emissions Resulting from the Use and Demilitarization of Common Pyrotechnic Devices*  
Sylvie Brochu, Marc-Olivier Turcotte-Savard (CANADA)
- 2:30 p.m. *Proof of Concept Novel Low Toxicity Obscurant (SERDP WP2405)*  
Joost van Lingen, Denise Meuken (NETHERLANDS)
- 2:50 p.m. *Barium-Free Green Illuminants Based on Magnesium Diboride*  
Jason S. Brusnahan, Jay C. Poret, Jared D. Moretti, Anthony P. Shaw,  
Rajendra K. Sadangi (AUSTRALIA/USA)

BREAK 3:10 p.m. – 3:40 p.m. POSTERS

**Session H:                    Environmental Aspects II**  
**Session Chairs:            Dr. David Dye & Dr. Girish Srinivas**

- 3:40 p.m. *Improved Blue and Green Colored Pyrotechnical Smoke Formulations*  
Johann Glück, Thomas M. Klapötke, Magdalena Rusan, Anthony P. Shaw  
(GERMANY/USA)
- 4:00 p.m. *Blue-Colored Pyrotechnics using Copper (I) Bromide as Emitter*  
Dominykas Juknelevicius, Eero Karvinen, Thomas M. Klapötke, Rytis Kubilius,  
Arunas Ramanavicius, Magdalena Rusan (GERMANY/FINLAND/LITHUANIA)
- 4:20 p.m. *Continued Efforts toward a Perchlorate-Free Green Illuminant Composition for the M195 Hand Held Signal*  
Jared D. Moretti, Gary Chen, Jesse Sabatini (USA)
- 4:40 p.m. *Development of Green Extrudable Pyrotechnic Delays for the Navy*  
Scott D. Hall (USA)
- 5:00 p.m. *Development and Testing of Less Toxic, Hygroscopic Metal Chlorides*  
Giancarlo Diviacchi (USA)

Wednesday, 7/13/2016

**Session I: Delays, Igniters, and Initiation I**

**Session Chairs: Mr. Scott Hall & Dr. Jay Poret**

- 8:00 a.m. *The Properties of Pyrotechnic Compositions Based on Boron and Bismuth Trioxide*  
A. E. Cardell, T. T. Griffiths (UK)
- 8:20 a.m. *Titanium Aluminum/PTFE Composite Particles for Enhanced Ignitability and Combustion*  
Matthew J. Wilcox, Lori J. Groven (USA)
- 8:40 a.m. *The Burning Rate of Mn + MnO<sub>2</sub> and Mn + Sb<sub>2</sub>O<sub>3</sub> Delay Compositions*  
Y. C. Montgomery, W. W. Focke, O. Atanasova, O. Del Fabbro, C. Kelly (SOUTH AFRICA)
- 9:00 a.m. *Igniter Composition with Low Moisture Susceptibility*  
Girish Srinivas, Brady Clapsaddle, Robert Bolskar, Mike Looker (USA)
- 9:20 a.m. *Electrostatic Discharge Sensitivity of Titanium Potassium Perchlorate at Varying Densities*  
Joseph Olles, William Wentz, Ryan R. Wixom (USA)

BREAK 9:40 a.m. – 10:10 a.m. POSTERS

**Session J: Delays, Igniters, and Initiation II**

**Session Chairs: Mr. Scott Hall & Dr. Jay Poret**

- 10:10 a.m. *Development of an Environmentally Benign Pyrotechnic Delay System*  
Zac Doorenbos (USA)
- 10:30 a.m. *Si-BaSO<sub>4</sub> vs. Si-CaSO<sub>4</sub> Pyrotechnic Time Delay Compositions: The Effect of Fuel Particle Size and Additives on Reactivity*  
Shepherd M. Tichapondwa, Walter W. Focke, John Gisby, Olinto Del Fabbro, Cheryl Kelly, George Labuschagne (SOUTH AFRICA)
- 10:50 a.m. *Combustion Characteristics of W/MnO<sub>2</sub> as an Environmentally Friendly Time Delay System*  
Josh Koenig, Anthony P. Shaw, Jay C. Poret, Lori J. Groven (USA)
- 11:10 a.m. *Electrical Comparisons of Ignition versus Initiation*  
Cole Valancius (USA)

**11:30 a.m. – 12:00 p.m. POSTERS**

*Wednesday afternoon is free time.*

*No lunch will be provided on this day.*

Thursday, 7/14/2016

**DR. BERNARD E. DOUDA YOUNG SCIENTIST AWARD**

**Dr. Jonathan Dilger**

8:00 a.m.

**Presented by Dr. Gregory D. Knowlton,  
President IPSUSA Seminars, Inc.; Treasurer, IPS**

8:20 a.m. *Pyrolysis/Gas Chromatography/Mass Spectrometry: A New Tool to Detect Toxic Byproducts of Pyrotechnic Reactions*  
Jonathan M. Dilger, Eric J. Miklaszewski, Douglas M Papenmeier,  
Caroline K. Wilharm, Matthew A. Neiswinger (USA)

**Session K: Characterization Methods I**  
**Session Chairs: Dr. Michael Nardai & Mr. Anthony Di Stasio**

8:50 a.m. *Development of Standardized Test Methods for Small Arms Muzzle Flash Measurements*  
David F. Dye, Jason M. Davis (USA)

9:10 a.m. *Development of a Heat Flux Measurement Technique to Aid Understanding of Ignition of Pyrotechnics and Propellants*  
Nicholas Johnson, Clive Woodley (UK)

9:30 a.m. *Electromagnetic Amplification of Pyrotechnic Emissions*  
Eric Miklaszewski, Jonathan Dilger, James B. Michael, Travis R. Sippel (USA)

BREAK 9:50 a.m. – 10:20 a.m. POSTERS

**Session L: Characterization Methods II**  
**Session Chairs: Dr. Michael Nardai & Mr. Anthony Di Stasio**

10:20 a.m. *Introduction to Pyrotechnic Light Measurements*  
Jay C. Poret (USA)

10:40 a.m. *Emission Spectroscopy on Pyrotechnic Mixtures*  
Sebastian Knapp, Christian Günthner, Evelin Roth, Angelika Raab, Volker Weiser (GERMANY)

11:00 a.m. *Blast Response of Reinforced Concrete Slabs with Varying Standoff and Steel Reinforcement Ratios*  
Fausto Batista Mendonça, José Atílio Fritz Fidel Rocco, Koshun Iha, Girum Solomon Urgessa (BRAZIL)

11:20 a.m. *Comprehensive Chemical and Material Analysis of TKP and THxKP Pyrotechnic Powders to Improve Pyrotechnic Degradation and Performance Models*  
C. Beppler, J. Dellinger, M. Cooper, W. Erikson (USA)

LUNCH 11:40 a.m. – 1:20 p.m.

#### **BURSARY AWARD WINNER**

**Mr. Robert Timms**

1:20 p.m. **Presented by Dr. Gregory D. Knowlton**  
**President IPSUSA Seminars, Inc.; Treasurer, IPS**

1:40 p.m. *A Two-Dimensional Model for Melting and Ignition of a Thin Sheared Viscous Layer*  
Robert Timms, Richard Purvis (UK)

**Session M: Modeling I**  
**Session Chairs: Dr. Jason Brusnahan & Dr. Shepherd Tichapondwa**

2:10 p.m. *Molecular Dynamics Simulation of Cohesion within Solid Propellants*  
Michael M. Nardai, Manfred A. Bohn (GERMANY)

2:30 p.m. *Modelling of Measurement Data on the Curing Reaction of HTPB with Isocyanate Obtained by Heat Flow Microcalorimetry and Pressure Decrease in Closed Vessel Cells*

Manfred A. Bohn (GERMANY)

2:50 p.m. *HNS Critical Thickness Reactive Burn Modeling*

C. D. Yarrington, A. S. Tappan, R. Knepper, R. R. Wixom (USA)

BREAK 3:10 p.m. – 3:40 p.m. POSTERS

**Session N: Modeling II**

**Session Chairs: Dr. Jason Brusnahan & Dr. Shepherd Tichapondwa**

3:40 p.m. *Characterization of ANFO using Aquarium Test and Numerical Modeling Methods*  
Eduardo Lozano, Vilem Petr (USA)

4:00 p.m. *Modelling the Ignition of Explosives by Pinch with the HERMES Model*  
John Curtis, Jack Reaugh (UK/USA)

4:20 p.m. *Thermodynamic Modeling for the Characterization and Development of Pyrotechnic Smoke Formulations*

Anthony P. Shaw, Jason S. Brusnahan, Jay C. Poret, Lauren A. Morris  
(USA/AUSTRALIA)

4:40 p.m. – 5:10 p.m.

**International Pyrotechnics Society Business Meeting  
Announcement of 43<sup>rd</sup> IPS Venue**

6:30 p.m. – 10:00 p.m.

**Varaison Vineyards and Winery  
(Open to all IPS Members and their families/friends/associates)**



***\*All posters MUST be removed by Thursday evening\****

Friday, 7/15/2016

**Session O: Biocidal Pyrotechnics**

**Session Chairs: Ms. Denise Meuken & Mr. Christopher Williams**

8:30 a.m. *From Fireworks to Biocides: Formulations to Defeat Biological Threats with Heat and Iodine*

Jimmie C. Oxley, James L. Smith, Matthew M. Porter, Maxwell Yekel,  
Rebecca Levine (USA)

8:50 a.m. *Alternative Fuels for Direct Write Printed Biocidal Formulations*

Fidel D. Ruz-Nuglo, Anthony P. Shaw, Jay C. Poret, Lori J. Groven (USA)

9:10 a.m. *Pyrotechnically Generated and Disseminated Aerosol for Bio-Agent Defeat*

Amee L. Polk, Lisa S. Smith, Michael F. Kauzlarich, Nino L. Bonavito,  
Vipin K. Rastogi (USA)

BREAK 9:30 a.m. – 9:50 a.m.

**Session P: Devices and Applications**

**Session Chairs: Ms. Denise Meuken & Mr. Christopher Williams**

- 9:50 a.m. *Functional Reliability Prediction of Pyrotechnic Separation Device*  
Zaeill Kim, Byungtae Ryu, Yeung Jo Lee, Byeong Min Mun, Daehyun Hwang,  
 Nam-ho Kim (S. KOREA)
- 10:10 a.m. *Simulation of Deterrent Concentration Decrease at the Surface and its Influence on Propellant Properties*  
 Bertrand Roduit, Marco Hartmann, Manfred Kaiser, Patrick Folly,  
 Alexandre Sarbach (SWITZERLAND/GERMANY)
- 10:30 a.m. *A Fast Low-Energy Optical Detonator*  
 Herbert Scholles, Rainer Schirra, Helmut Zoellner (GERMANY)
- 10:50 a.m. Parting Remarks (Dr. Gregory D. Knowlton, Prof. Lori J. Groven, and  
 Dr. Anthony P. Shaw)
- 12:00 p.m. – 2:00 p.m. ***Wine & Cheese Farewell Social***  
***(Everyone is Welcome)***

## **POSTERS**

- 1) *Direct Versus Indirect Heat Transfer for Fast Melting of Metals*  
Sujoy Debnath, Abhishek Raj, SK Sahoo, PM Deshmukh, SM Danali (INDIA)
- 2) *Midrange-Infrared Thermal Imagery - A Novel Approach for Testing Pyrotechnic Devices*  
Kevin P. Caska, Andrew Zimmer (USA)
- 3) *Thermal Modelling of a Medium Energy Electro-Pyrotechnic Initiator*  
G. Demézon, L. Soulié, V. Jaillant, F. Plazanet (FRANCE)
- 4) *Five-Membered NMO-chelates with Multiple Coordination Modes: A Family of Semicarbazide Based High Energy Materials*  
 Wenchao Tong, Li Yang, Tonglai Zhang (CHINA)
- 5) *Investigation on Performance Enhancement of Exploding Foils by B/Ti Composites*  
Wang Liang, Wang Yao, Jiang Xiaohua (CHINA)
- 6) *In-Situ Preparation of Porous Nickel Azide and Its Performance Tests*  
Yan Li, Song Cheng, Shunguan Zhu (CHINA)
- 7) *Effect of Self-Assembly on the Combustion and Sensitivity of Aluminum/Iron Oxide Nanothermites*  
M. L. Tan, S. Pisharath, F. Zhang, N. Sasidharan, H. G. Ang (CHINA)
- 8) *Automated Loading Process of Primary Explosive Formulations in End Items*  
 Matthew Puszynski, Zac Doorenbos, Gartung Cheng, Neha Mehta (USA)
- 9) *Some Comparative Aspects of the Energetic Materials: from Nanoparticles, 1D Nanowires, 2D Nanofilms, to 3D Interconnected Foam Structures*  
Zhaohua Luan, Darold Martin, Rajendra K. Sadangi, Ryan R. Carpenter, Mills C. Kendall,  
 Lauren A. Morris, Christopher D. Haines (USA)
- 10) *DBX-1 Green Primary use in M55 & M100 Detonators*  
Neha Mehta, Steve Marino, Pam Tran, Deborah Romeo, Gartung Cheng, Karl Oyler  
 (USA)
- 11) *Accelerated Aging of MTV*  
Caroline K. Wilharm (USA)
- 12) *Issues and Observations during Scale up of Pyrotechnic Flare Compositions in Multiple Form Factors*  
Christina M. Yamamoto, Eric Miklaszewski (USA)

- 13) *Ceramic Matrix Pyrophoric Substrates & Structures*  
Zac Doorenbos, Kendall Mills, Juan Patino, Chris Haines, Jan Puszynski (USA)
- 14) *Mathematical Modeling for Separation Behavior of Pyrotechnic Separation Device*  
Dae-Hyun Hwang, Juho Lee, Jae-Hung Han, YeungJo Lee, Dongjin Kim (S. KOREA)
- 15) *Design and Test on Pyroshock-reduced Separation Device*  
Yeung Jo Lee, Zaeill Kim, Hong Been Chang (S. KOREA)
- 16) *Study on Direct Write Charging Based on Core-Shell Structured Al/CuO by Inkjet Printing*  
Yan Hu, Li Qian, Lizhi Wu, Yinghua Ye, Ruiqi Shen (CHINA)
- 17) *Electrospun Nanofiber-Based B/NC Composite and Their Reactive Properties*  
Ying Hong, Xiangyu Li, Chuan Huang, Yanchun Li, Yi Cheng (CHINA)
- 18) *Environmental Friendly Cost Effective Alternative Solvent for Safe Synthesis of Diazidoglyoxime: An Important Intermediate for TKX-50*  
Nandagopal, Sudhir, Rohit, MB Talawar, Arvind Kumar, NPN Rao, Manoj Gupta (INDIA)
- 19) *Development of a Lean Process to the Lead-Free Primary Explosive DBX-1*  
Davin Piercey, David Ford, Jerry Salan, Andrew Pearsall, Neha Mehta, Karl Oyler, Gartung Cheng (USA)
- 20) *Synthesis and Thermal Decomposition of 2-Difluoroaminomethyl-2-Methyl Propane-1,3-diol Dinitrate (DFAMPDN)*  
Wenfang Zheng, Ying Mei, Xiangyang Lin, Juan Li, Renming Pan (CHINA)
- 21) *European Directive 2013/29/EU and Person with Specialist Knowledge*  
Lionel Aufauvre, Christian Michot (FRANCE)
- 22) *Titanium Aluminum/PTFE Composite Particles for Enhanced Ignitability and Combustion*  
Matthew J. Wilcox, Lori J. Groven (USA)
- 23) *Mechanisms of Thermite Reactions during Combustion of Magnesium with Lunar and Martian Regolith Simulants*  
Sergio Cordova, Armando Delgado, Evgeny Shafirovich (USA)
- 24) *Electrostatic Discharge Degradation of Titanium Potassium Perchlorate*  
William Wentz, Joseph Olles, Michael Willis (USA)
- 25) *Development of Pyrotechnic Formulations for Deep Bore Well Patching and Plugging*  
Kuanysch Kuramyssova, Sara Row, Bill Lowry, Ken Coates, Lori Groven (USA)
- 26) *Power Density and Operating Conditions for use of the ResonantAcoustic® Mixer*  
Peter Lucon (USA)
- 27) *Capture of a Particles Cloud Dispersed by an Explosive Charge*  
F. Ballanger, D. Counilh, N. Rambert, J.-F. Haas, A. Chinnayya (FRANCE)
- 28) *Capabilities and Success Stories from the U.S. Army's Pyrotechnics Research, Development, and Pilot Plant Branch at Picatinny Arsenal*  
Andrew T. Zimmer, James L. Wejsa (USA)
- 29) *Compatibility of Tetranitroacetimidic Acid with the Materials Used*  
Xiangyang Lin, Ying Li, Shan Shao, Wenfang Zheng, Renming Pan (CHINA)