

## 45<sup>th</sup> IPS Seminar Daily Agenda

Monday, 7/11/2022

8:00 a.m. **Introduction: Dr. Greg Knowlton - President, IPSUSA Seminars, Inc.**

8:10 a.m. **Welcome: Dr. Zachary Doorenbos and Mr. Christopher Csernica**  
**Seminar Co-Chairs**

**Session A: Fireworks**

**Session Chairs: Dr. Jesse Sabatini and Dr. Anthony Shaw**

8:20 a.m. **KEYNOTE ADDRESS: Homer H. Hickam, Bestselling author of “Rocket Boys,” “Don’t Blow Yourself Up,” and retired NASA Engineer**

9:20 a.m. *New Stroboscopic Effect for Fireworks: Theoretical Approach for Comprehension and Modelisation*

J. L. Dumont, D. Médus, P. Thébault (FRANCE)

9:40 a.m. *Brandy, Varnish, and Vinegar? Not Your Typical Gunpowder Ingredients*

Tessy S. Ritchie, Dawn E. Riegner (USA)

10:00 a.m. *Investigation of Sparkler Formulations*

Magdalena Rusan (GERMANY)

BREAK/POSTER SETUP 10:20 a.m. - 10:50 a.m.

**Session B: Microwave Effects**

**Session Chairs: Dr. Lori Groven and Mr. Tim Manship**

10:50 a.m. *Microwave Enhancement of Boron Propellant Combustion*

Adam Lawrence, Travis Sippel (USA)

11:20 a.m. *Microwave-Initiated Antenna Ignitors with Bandwidth Selectivity*

Justin Lajoie, Stuart Barkley, Travis Sippel (USA)

11:40 a.m. *On-Command Pyrotechnic Light, Color, and Temperature Enhancement through Microwave Irradiation*

Stuart J. Barkley, Will Crespo, Ryan Ogorzalek, Travis Sippel (USA)

LUNCH 12:00 p.m. - 1:20 p.m.

**Session C: Propulsion Influence**

**Session Chairs: Dr. Steve Son and Dr. Jared Moretti**

1:20 p.m. *Thermal Decomposition of Ammonium Perchlorate with LiCoO<sub>2</sub> based Catalysts*

Chase Wernex, Benjamin Hirt, Metin Örne, Alp Sehirlioglu, Steve Son (USA)

1:40 p.m. *Martian Rocket Fuel: Novel Solid Propellants enabled through ISRU of Martian Perchlorates*

Alexander C. C. Hoganson, Hetal Rathore, Steven F. Son (USA)

- 2:00 p.m. *Correlation of Dynamic Mechanical Analysis and Indentation Data to Uniaxial Tensile Mechanical Properties using Machine Learning Algorithms*  
Tim Manship, C. Jarocki, D. Klinger, G. Caito, A. Casey, A.H. Strachan, S.F. Son (USA)
- 2:20 p.m. *An Exploration of Molecular Perovskites for Composite Propellant Applications*  
Shakole M. Rugh, Lori J. Groven (USA)

BREAK/POSTER SETUP 2:40 p.m. - 3:10 p.m.

**Session D: RAM/Material Processing**  
**Session Chairs: Dr. Jan Puszynski and Dr. Dylan Kline**

- 3:10 p.m. *Advances in Acoustic Mixer Processing Methods and Characterization*  
Justin Whaley, Lawrence Farrar (USA)
- 3:30 p.m. *Continuous Resonant Acoustic<sup>®</sup> Production of Energetic Material*  
Lawrence Farrar, Justin Whaley, Joe Mayne, Stephanie Trant (USA)
- 3:50 p.m. *Emerging Methods for Toxicological Testing*  
Emily N. Reinke, William S. Eck (USA)
- 4:10 p.m. *Application of Sample Controlled Differential Scanning Calorimetry to Pyrotechnic Systems*  
E. L. Charsley, T. T. Griffiths, G. M. B. Parkes, R. V. Pettifer, J. J. Rooney (UK)
- 4:30 p.m. *Influence of Mixture Properties and Preparation Methods on Burning Rate of Pyrotechnic Mixtures*  
Sebastian Knapp, Evelin Roth, Wolfgang Becker, Stefan Kelzenberg, Volker Weiser (GERMANY)

6:00 p.m. to 10:00 p.m. *Picnic Mixer in the Courtyard & Elevations Dining Room*  
*Everyone is invited; including children, friends, etc.*

Tuesday, 7/12/2022

**Session E: Material Influence**  
**Session Chairs: Dr. Lori Groven and Ms. Cathleen Freeman**

- 8:00 a.m. **INVITED SPEAKER – Michelle Pantoya (USA)**  
*The Reactive Behaviors of Stressed-Out Fuel Particles*
- 8:50 a.m. *Flexoelectricity in Reactive Systems*  
Mikel J. Zaitzeff, Lori J. Groven (USA)
- 9:10 a.m. *Re-ignitable Electric Solid Propellant: A Safer, Versatile Energetic for Pyrotechnic Simulators and Special Effects*  
Wayne N. Sawka, Trisha Buescher, Trevor Summerfield (USA)
- 9:30 a.m. *Computational Analysis of PVDF/nAl Composites under Laser Excitation*  
Daniel Olsen, Kyle Uhlenhake, Mateo Gomez, Metin Örneç, Steven F. Son, Min Zhou (USA)

BREAK/POSTERS 9:50 a.m. - 10:10 a.m.

**Session F: Propulsion Measurement and Effects**  
**Session Chairs: Mr. Scott Hall and Mr. Sebastian Knapp**

- 10:10 a.m. *Comparison of Burning Rate Measurements for Crawford Bomb, Class III Motor, and Dual Propellant Pseudo Motor*  
T. R. Wagner, D. Klinger, H. Amadeo, T. D. Manship, S. F. Son (USA)
- 10:30 a.m. *Novel Small Caliber Propellants for Increased Barrel Life and Flash Reduction*  
Adam M. Jacob (USA)
- 10:50 a.m. *Development and Study of an AP/HTPB based Composite Solid Propellant Base Bleed Grain for 155 mm Artillery Projectile*  
Amir Mukhtar, Habib Nasir, Badar Rashid (PAKISTAN)
- 11:10 a.m. *Microwave Interferometry for the Measurement of Propellant Regression Rate under Motor-Like Conditions*  
Daniel J. Klinger, Steven F. Son (USA)

GROUP PHOTO & LUNCH 11:30 a.m. - 12:50 p.m.

**Session G: Synthesis**  
**Session Chairs: Dr. Joost van Lingen and Dr. Shingo Date**

- 12:50 p.m. *Bis(1,2,4-oxadiazolyl) Furoxan: A Promising Melt-Castable Eutectic Material of Low Sensitivity*  
Eric C. Johnson, Eric J. Bukowski, Jesse J. Sabatini, Rosario C. Sausa, Edward F. C. Byrd, (USA)
- 1:10 p.m. *Energetic Materials Based on 1,2,4-triazines*  
Shannon E. Creegan, Matthias Zeller, Edward F. C. Byrd, Davin G. Piercey, (USA)
- 1:30 p.m. *Development of ResonantAcoustic<sup>®</sup> Continuous Microreactor (RACMR) and ResonantAcoustic<sup>®</sup> Continuous Crystallizer (RACC)*  
J. M. Mayne, S. J. Trant, L. C. Farrar (USA)
- 1:50 p.m. *Multi-nozzle Spray Synthesis of Silver Azide Nanoparticles: Early Steps of a New Process*  
Guillaume Galland (FRANCE)
- 2:10 p.m. *TKX-50: A New High Explosive Developed at LMU Munich*  
Thomas M. Klapötke, Stanisław Cudziło, Waldemar A. Trzeciński, Muhamed Suceška (GERMANY)

BREAK/POSTERS 2:30 p.m. - 2:50 p.m.

**Session H: Pyrotechnic Systems**  
**Session Chairs: Dr. Jay Poret and Mr. Matt Puszynski**

- 2:50 p.m. *Pyrotechnic and Bullet Material of Construction Cumulative Impact on Tracer Performance*  
Travis Clements (USA)
- 3:10 p.m. *Effect of Percussion Primer Pressure Output on Performance of Pyrotechnic Time Delay Systems*  
Daniel Perkins, Matthew Puszynski, Jan Puszynski, Rajinder Gill, Anthony Shaw, Jay Poret, Neha Mehta (USA)

- 3:30 p.m. *Pyrotechnic Autoignition Material Development and Evaluation at Nammo Defense Systems, Inc.*  
Scott Hall (USA)
- 3:50 p.m. *Thermitic Thermodynamics – Characteristics of an Adiabatic Metal-Metal Oxide Reaction Matrix*  
Anthony P. Shaw (USA)
- 4:10 p.m. *Methodological Approach for the Determination of Initiation Energy and Activation Energy of Pyrotechnic Compositions*  
M. Milhe-Poutingon, M. Ducros, C. Sandré, D. Médus (FRANCE)
- 4:30 p.m. - 6:30 p.m. Poster Session (snacks & cash bar) in the Douglas and El Paso rooms

Wednesday, 7/13/2022

**Session I: Explosives**  
**Session Chairs: Dr. Magdalena Rusan and Dr. Denis Spitzer**

- 8:00 a.m. **INVITED SPEAKER – Ernst-Christian Koch (GERMANY)**  
*Thermal and Shock Initiated Reactions in Phosphorus(V) Nitride*
- 8:50 a.m. *Experimental Investigation into the Safety Distance for Ethane-Oxygen Gas Explosion Applied to Industrial Cleaning*  
Lea Davis, Vilem Petr (USA)
- 9:10 a.m. *ADN: A Multivalent Explosive Compound*  
Cedric Schwartz, Marc Comet, Fabien Schnell, Bastien Lallemand, Denis Spitzer (FRANCE)
- 9:30 a.m. *Characterization of Sub-mm Scale 2-Pore Defects on Detonation Performance in PBX-9501*  
Gabriel Montoya, Joseph R. Lawrence, Terry Salyer, Steven F. Son (USA)

BREAK/POSTERS 9:50 a.m. - 10:20 a.m.

**Session J: Explosive Effects**  
**Session Chairs: Mr. Sebastian Knapp and Dr. Anthony Shaw**

- 10:20 a.m. *Influence of Engineered Defects in a Rubberized Explosive on Detonation Shape and Performance*  
Joseph R. Lawrence, Gabriel Montoya, Steven F. Son (USA)
- 10:40 a.m. *Phlegmatization of TATP and HMTD with Activated Charcoal for the Use in Explosive Detection Dog Training*  
Isabel Wilhelm, Michael Wittek, Martin Haertel, Dirk Roeseling (GERMANY)
- 11:00 a.m. *Effect of Mechanical Impact on PBX Disks Investigated by DMA*  
Manfred A. Bohn, Michael J. Herrmann (GERMANY)

**BURSARY AWARD WINNER**

**Dr. Uwe Schaller**

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

11:20 a.m. *Investigation of a Butyl-Substituted LT-EIL Based on Dinitramide*  
Uwe Schaller, Volker Gettwert, Volker Weiser, Thomas Keicher (GERMANY)

***Wednesday afternoon is free time.***  
*No lunch will be provided on this day.*

Thursday, 7/14/2022

**Session K: Additive Manufacturing (AM)**  
**Session Chairs: Dr. Joost van Lingen and Dr. Thomas Klapötke**

8:00 a.m. **INVITED SPEAKER – Elbert Caravaca (USA)**  
*Additive Manufacturing of Gun Propulsion Charges Overview*

8:50 a.m. *Diagnostics Development and Technology Transfer for a High-Quality Direct-Ink-Write Additive Manufacturing Process*  
D. J. Kline, M. Sevcik, F. Wilson, H. E. Fletcher, G. Bjerke, R. Chavez-Morales, M. D. Grapes, G. C. Egan, D. A. Amondson, V. Eliasson, K. T. Sullivan, J. L. Belof (USA)

9:10 a.m. *An Electrically Conductive, Additively Manufacturable Explosive Composite*  
Wesley W. Chapman, Kush S. Patel, Terry R. Salyer, Jeffrey F. Rhoads, Steven F. Son (USA)

9:30 a.m. *Additively Manufactured (3DP) Thermite Structures vs Conventionally Manufactured Equivalents*  
Christine McGee, Ranko Vrcelj (UK)

BREAK/POSTERS 9:50 a.m. - 10:20 a.m.

**Session L: Pyrotechnic AM and Improved Systems**  
**Session Chairs: Ms. Lauren Morris and Dr. Manfred Bohn**

10:20 a.m. *Development & Analysis of Nano-thermite Formulations and Configuration Factors that Affect Performance*  
C. T. Freeman (USA)

10:40 a.m. *Ingredient Replacements for a Yellow Smoke Training Simulator*  
Mark Motyka, John Verdonik, Kelsey Westerkamp, Jared D. Moretti (USA)

11:00 a.m. *The Influence of Solvent Selection on Nitrocellulose-based, Perchlorate-Free Red-and Green-light Illuminants*  
Lance N. Kotter, Lori Groven (USA)

11:20 a.m. *Design, Fabrication, and Testing of a Miniaturized End-of-Life Ultimate Security Device using Reactive Composites*  
Florent Sevely, Samuel Charlot, Lionel Segulier, Fabien Mesnilgrente, Carole Rossi (FRANCE)

LUNCH 11:40 p.m. - 1:00 p.m.

**Session M: Pyrotechnic Effects**  
**Session Chairs: Mr. Scott Hall and Mr. Ken Smit**

- 1:00 p.m. *Materials Characterization of Commercially Available Nanoaluminum Powders*  
Lauren A. Morris, Aaron M. Stern, Daniel Wilson, Nicolas Tashjian,  
Cathleen Freeman (USA)
- 1:20 p.m. *Improving Laser Ignition Sensitivity of Boron using Mechanical Activation with PTFE*  
Kyle E. Uhlenhake, Dhruval Patel, Metin Örneke, Steven F. Son (USA)
- 1:40 p.m. *Effect of Preparation Conditions on Cyclic Thermal Behavior of some Phase-stabilized Ammonium Nitrate Prepared by Aqueous Solution Method*  
Shingo Date, Shin-ya Terada, Ryohei Nagahashi (JAPAN)
- 2:00 p.m. *From Spray Flash Evaporation to Spray Flash Synthesis: New Opportunities for Defence Materials*  
Denis Spitzer (FRANCE)

BREAK/POSTERS 2:20 p.m. - 2:40 p.m.

**Session N: Pyrotechnic Exploration**  
**Session Chairs: Dr. Shingo Date and Mr. Randy Busky**

- 2:40 p.m. *Composition Effects on Iron Carbon Composite Heat Sources*  
Aaron M. Stern, Lauren Morris, Zhaohua Luan, Rajendra Sadangi, Kendall Mills (USA)
- 3:00 p.m. *Composite Fuel/Oxidizer Crystals for Energetic Applications*  
Tristan W. Kenny, Lori J. Groven (USA)
- 3:20 p.m. *Combustion Model for Thermite Materials Integrating Explicit and Coupled Treatment of Condensed and Gas Phase Kinetics*  
E. Tichtchenko, Y. Sami, V. Folliet, O. Simonin, B. Bedat, L. Glavier, A. Esteve, C. Rossi (FRANCE)
- 3:40 p.m. *Thermal Analysis, Sensitivity and Ballistic Study of Novel Oxidizer/Fuel Based Formulations*  
D. M. Badgular, H. Prasanth (INDIA)

4:00 p.m. to 5:00 p.m. **International Pyrotechnics Society**  
**Business Meeting**  
Announcement of 46<sup>th</sup> IPS Venue  
IPS members and non-members are encouraged to attend

5:30 p.m. to 9:30 p.m. **Cheyenne Mountain Zoo**  
(Open to all IPS Attendees and their families/friends/associates)

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

Friday, 7/15/2022

**Session O: Apprentices and Novel Concepts and Processes**  
**Session Chairs: Dr. Jesse Sabatini and Dr. Jan Puszynski**

- 8:00 a.m. *The Development of Ordnance Materials and Explosives (O.M.E.)  
Apprenticeships for the UK Explosives Industry*  
David A. Holley (UK)
- 8:20 a.m. *Effect of Hardware Design on Stun Grenade Performance*  
Mark Motyka (USA)
- 8:40 a.m. *Piezo-Energetic Composite Film Fabrication and Poling Process for Pressure  
Sensor Applications*  
D. K. Messer, T. A. Hafner, M. Örnek, M. W. Paral, S. F. Son (USA)

BREAK 9:00 a.m. – 9:30 a.m.

**Session Q: Configuration Effects and Evaluation**  
**Session Chairs: Dr. Jared Moretti and Dr. Jay Poret**

- 9:30 a.m. *Corrosion of Ammunition Housing by DBX-1 and MIC Based Primer Slurries*  
Jan Puszynski, Jacek Swiatkiewicz, Daniel Perkins, Matthew Puszynski,  
Neha Mehta (USA)
- 9:50 a.m. *Safety Qualification of a Launch Rocket Motor for a Shoulder – Fired Weapon*  
Tzvi Shoham (ISRAEL)
- 10:10 a.m. *Influence of Mechanical Properties on the Explosiveness of Energetic Materials*  
M. Bolton, K. M. Jaansalu, M. Andrews (UK and BELGIUM)
- 10:30 a.m. to 10:50 a.m. Dr. Greg Knowlton and Co-Chairmen – Parting Remarks  
Adjourn the 45<sup>th</sup> International Pyrotechnics Society Seminar
- 12:00 p.m. to 2:00 p.m. ***Wine and Cheese Farewell Social***  
**(Everyone is welcome!)**

## **POSTERS**

- 1) *Research Experience and Capabilities of PetrExplosivesGroup.com*  
Vilem Petr, Lea Davis (USA)
- 2) *Insensitive Energetic Materials (IEMs) and Their Applications*  
Abdul Qadeer Malik (PAKISTAN)
- 3) *Ignitability of Pyrotechnics for Countermeasures*  
Marie Anna Shackelford, Millicent Smith, Leslie Gibbons, Mark Bishop (UK)
- 4) *Amine Oxidations Utilizing Superoxides*  
Tim Manship (USA)
- 5) *Effect of Time and Acceleration on Particle Size Refinement of Pyrotechnic Constituents  
During Processing in a Resodyn Mixer*  
Daniel Perkins, Matthew Puszynski, Jan Puszynski, Magdy Bichay, Todd Allen (USA)
- 6) *Evaluation of a New Source for Powdered and Granular Zirconium*  
Jan Puszynski, Dan Perkins, Magdy Bichay, Todd Allen (USA)

- 7) *Laser Ignition and Combustion Characteristics of B-Al Compound Powder without and with HMX*  
Da-yuan Gao, Wei Cao, Jian-zhong Liu, Qing-guan Song, Xiao Wei, Ji-fei Yuan, Xing-long Li, Cheng Hua (CHINA)
- 8) *Evaluation of Ignition and Combustion Properties of Boron Powders Coated with Various Additives*  
Sebastian Yongsen Quek, Sreekumar Pisharath, Huey Hoon Hng (SINGAPORE)
- 9) *Explosive Storage Chamber from Design to Final Validation Testing*  
Jérôme Mespoulet, Sébastien Boussac, Paul Deconinck (FRANCE)
- 10) *Development of Igniter for Base Bleed Unit for 155 mm Artillery Projectile*  
Hizba Waheed, Amir Mukhtar (PAKISTAN)
- 11) *Pyrotechnically Pumped Nd:YAG Laser Using Spectrally-Selective Emitters*  
Kenneth Smit, Valerian Kuznetsov, Dmitrii Stepanov (AUSTRALIA)
- 12) *Effects of Intrusive Window Testing on the Deflagration Dynamics of Propellants with Embedded Wires*  
Usman Bajwa, Steven Son, Jeffrey Rhoads, Terrence Meyer (USA)
- 13) *Disrupting the Oxide Layer in Aluminized Propellants using Select Aluminum-Group IIIA Alloys*  
Caleb Harper, Dhruval Patel, Catherine Bradley, Dr. Steven Son (USA)
- 14) *Thermal Imaging and Temperature Analysis of a Burning Delay Column Inside of Various Tube Materials*  
Nicholas E. Carlucci, Anthony P. Shaw, Jay C. Poret (USA)
- 15) *A Multi-Element Design for User-Selectable Time Delays*  
Jay C. Poret, Anthony P. Shaw, Lori J. Groven, Joshua T. Koenig (USA)
- 16) *An International Review on Green Insensitive Plastic Explosives*  
Christelle Collet (BELGIUM)
- 17) *Electrochemical Synthesis of Azo-coupled Energetic Materials*  
Joseph R. Yount (USA)