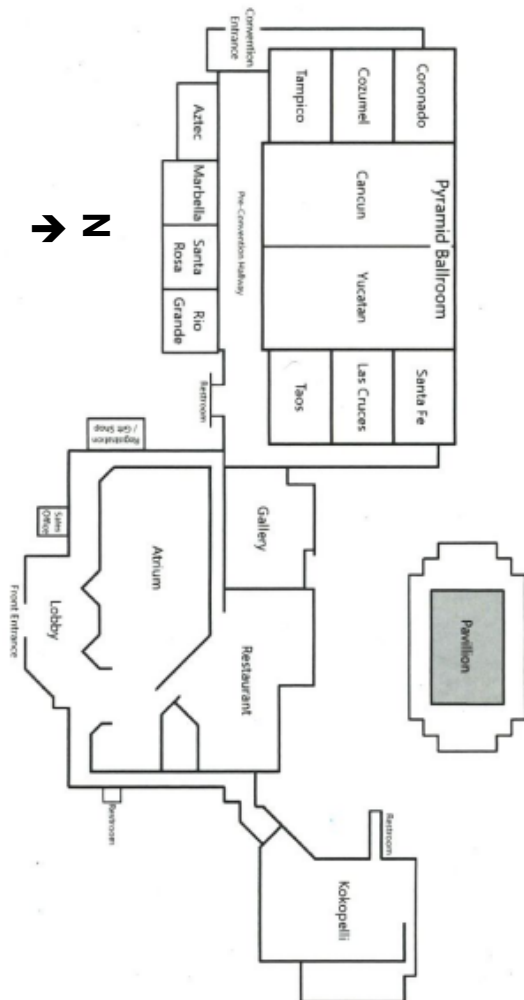


Please see
inside front cover for
Specific Events.



Albuquerque Marriott Pyramid Hotel North



IPSUSA
SEMINARS, Inc.
and the
INTERNATIONAL
PYROTECHNICS
SOCIETY



Present the

47th International Pyrotechnics Society Seminar

PROGRAM



July 14th - 18th, 2024 (Sunday - Thursday)
Albuquerque Marriott Pyramid Hotel
Albuquerque, New Mexico, USA



Seminar Co-Chairs

Mr. Noah Lieb
(Jensen Hughes)

Ms. Cathleen Freeman
(US Army - DEVCOM AC)

PROGRAM

47th International Pyrotechnics Society Seminar

Albuquerque Marriott Pyramid Hotel,
Albuquerque, New Mexico, USA
July 14th – 18th, 2024 (Sunday – Thursday)

The Week in Review:

General Information:

Registration will continue Monday – Wednesday from 7:30 a.m. to 5:00 p.m. in the Pyramid Ballroom Foyer in front of the Santa Rosa room (exception: starts 7:00 a.m. on Monday).

All **Continental Breakfasts** will be served from 6:30 a.m. to 8:00 a.m. in the Gallery room.

Poster setup will be held in the Aztec room.

General Sessions, will start at 8:00 a.m. and will be held in the Yucatan and Cancun rooms (of the Pyramid Ballroom).

All **Lunches** will be served around 12:00 p.m. in the Coronado, Cozumel, and Tampico rooms.

All **Breaks** will be served in the Pyramid Ballroom Foyer.

Sunday, July 14th:

Registration begins at 4:00 p.m. to 8:00 p.m. in the Pyramid Ballroom Foyer.

Reception will be held from 6:00 p.m. to 9:00 p.m. in the Santa Fe, Las Cruces, and Taos rooms.

Monday, July 15th:

Lunch will be in the Coronado, Cozumel, and Tampico rooms from 12:00 p.m. to 1:20 p.m., except for the IPSUSA Officers/Staff, Co-Chairs, Session Chairs, and IPS Officers (by invitation only), which will be held in the Marabella room.

Poster Session, attended by the authors, will be held from 3:00 p.m. to 3:20 p.m. in the Aztec room.

Picnic Mixer will be held from 6:00 p.m. to 10:00 p.m. in the Outdoor Special Events Pavilion (with Mariachi musicians).

Session M: Analytical Techniques: Testing & Facility Capabilities

Session Chair: Jamie Lee

- 1:00 M-1 *Forensic Detection of Pyrotechnic Mixtures by using FTIR-ATR*
Karol Zalewski, Mateusz Szala (POLAND)
- 1:20 M-2 *Blast and Explosion Research and Testing*
Mohsen Sanai, Joe Crepeau, Waylon Weber, Sean P. Cooper (USA)
- 1:40 M-3 *New Fast-Dynamics Facility for Tests on Reactive Material*
Raphael RODIER, Romain BOISSON, Sergio CAVALLI (FRANCE)

Break/Posters 2:00 - 2:20

Session N: Material Reactivity: Propellants & Pressure Generation

Session Chair: Gretel Raibeck

- 2:20 N-1 *Development and Study of an AP/HTPB based Composite Solid Propellant Base Bleed Grain for 155 mm Artillery Projectile*
Amir Mukhtar, Habib Nasir, Hizba Waheed (PAKISTAN)
- 2:40 N-2 *Sustainable Development of Gas Generant Formulations for Application in Automotive Airbags*
Steven Butler, Justin Park, Zayn Rhodes, Ivan Mendenhall (USA)
- 3:00 **Dr. Magdalena Rusan,**
Announcement for the 48th IPS Venue for 2025
- 3:20 **Dr. Gregory Knowlton,**
Parting words from the President of IPSUSA
- 4:00 **International Pyrotechnics Society Business Meeting**
IPS members and non-members are encouraged to attend
- 5:30 p.m. to 9:30 p.m. ***El Pinto Restaurant***
(Open to all IPS Attendees and their families/friends/associates)

* All posters MUST be removed by Thursday at 5:00 PM *



Please see back cover for map of the hotel.

Thursday, 7/18/2024

Session K: Analytical Techniques: Testing Methodologies

Session Chair: Marcin Rosol

- 8:30 K-2 *Development of a Pilot Plant for High Explosives Synthesis*
Suzanne Hurrey, Nate Zuckerman, Alec Cielinski (USA)
- 8:50 K-3 *Manometric Bomb: from Design to Final Validation Testing*
Sébastien BOUSSAC, Romain BOISSON,
Sergio CAVALLI (FRANCE)
- 9:10 K-4 *Assessing Chemical Compatibility of Energetic Materials – Is following just standards adequate?*
Manfred A. Bohn (GERMANY)
- 9:30 K-5 *The Henkin-McGill Critical Temperature Test Revisited*
Jason I. Phillips (USA)

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

Session L: Analytical Techniques: Modeling

Session Chair: Scott Hall

- 10:40 L-1 *Understanding the Effects of Ionizing Radiation on Explosives and Energetic Functional Groups*
Patricia L. Huestis, Nicholas Lease, Brooke R. Baumgarten,
Chris E. Freye, Lisa M. Klamborowski, Tammie Gibson,
Virginia W. Manner (USA)
- 11:00 L-2 *Estimation of the Coefficient of Thermal Expansion of Energetic Composites with Application to the Estimation of the Bulk Modulus*
Kevin Jaansalu, Léo Tinchon (BELGIUM)
- 11:20 L-3 *Improving the Accuracy of Calculated Formation Enthalpies for Energetic Salts*
Erwan Ott, Julien Glorian, Didier Mathieu (FRANCE)
- 11:40 L-4 *Numerical Prediction of Erosion in a Rocket Motor*
Flint Pierce, Joshua Smith, Jeremiah Dickey, Nigel Brassington (USA)

Lunch 12:00 p.m. - 1:00 p.m.

Tuesday, July 16th:

Group Photo Session outdoors (location to be determined) at 11:30 a.m.

Lunch will be in the Coronado, Cozumel, and Tampico rooms from 11:40 a.m. to 12:50 p.m.

Poster Session, attended by the authors, will be held from 9:50 a.m. to 10:10 a.m. and 2:40 p.m. to 3:00 p.m. in the Aztec room.

Young Scientist Award presentation at 12:50 p.m. to 1:00 p.m. in the General Session.

Poster Session will be held from 4:00 p.m. to 6:30 p.m. in the Aztec room.

Wednesday, July 17th:

Poster Session, attended by the authors, will be held from 9:20 a.m. to 9:50 a.m. in the Aztec room.

Frank Carver Bursary Award presentation at 8:10 a.m. to 8:20 a.m. in the General Session.

Thursday, July 18th:

Lunch will be in the Coronado, Cozumel, and Tampico rooms from 12:00 p.m. to 1:00 p.m.

Poster Session, attended by the authors, will be held from 9:50 a.m. to 10:40 a.m. and 2:20 p.m. to 2:40 p.m. in the Aztec room.

International Pyrotechnics Society Business Meeting at 3:20 p.m. to 4:40 p.m. IPS members and non-members are encouraged to attend.

Note: Poster presenters will need to take their posters down at the end of the Poster Session no later than 5:00 p.m.

Dinner at the El Pinto Restaurant from 5:30 p.m. to 9:30 p.m. *
(Buses depart from the Hotel to the El Pinto Restaurant at 5:00 p.m. to 5:30 p.m.).

* NOTE: "Evening Dinner at the El Pinto Restaurant is Casual"

Monday, 7/15/2024

8:00 *Introduction:* Dr. Greg Knowlton
President, IPSUSA Seminars, Inc.
8:10 *Welcome:* Noah Lieb and Cathleen Freeman
Seminar Co-Chairs

**Session A: Material Reactivity:
Pyrotechnic Applications**

Session Chair: Dr. Anthony Shaw

8:20 A-1 **KEYNOTE ADDRESS: Mr. Mike Siirila,**
Chief Engineer, Estes Energetics
*Presents on the Rebuilding and Reshoring Production
of Black Powder and Critical Chemicals*

9:20 A-2 *Black Powder Ignitibility Framework for Large Systems*
Christopher Csernica, Adrian Blot, Ryan Hanc (USA)

9:40 A-3 *Investigation of Sparkler Compositions and Boron-based
Pyrotechnic Formulations*
Magdalena Rusan, (GERMANY)

10:00 A-4 *Demonstration of a Fully Green M213 Fuze System for M67
Hand Grenade*
Daniel Perkins, Maciej Puszyński, Anthony Shaw,
Jay Poret, Rajinder Gill, Neha Mehta (USA)

Break/Poster Setup 10:20 - 10:50

**Session B: Material Processing: Additive
Manufacturing & Coatings**

Session Chair: Dr. Zac Doorenbos

10:50 B-1 *3D Printing of some Gas Generating Composition using Vat
Photopolymerization Method*
Takahiro Okano, Kosuke Shirase, Shingo Date (JAPAN)

11:20 B-2 *3D Printing of Potassium Perchlorate-based Composition
using Vat Photopolymerization Method*
Shingo Date, Takahiro Okano, Kosuke Shirase,
Sakura Sakakibara (JAPAN)

11:40 B-3 *Coating of HMX Particles by NTO to Formulate Nano-Core-
Shell Particles by Spray Flash Evaporation (SFE)*
Maxime BLANCHON, Anna OTT, Bastien LALLEMAND,
Antoine OSMONT, Denis SPITZER (FRANCE)

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

Wednesday, 7/17/2024

Session I: Material Sensitivity: Intrinsic & External Effects

Session Chair: Nicholas Carlucci

8:10 I-1 **FRANK CARVER BURSARY AWARD WINNER**
Declan Williams
Presented by Dr. Magdalena Rusan,
Vice President, IPS

8:20 I-2 *The Challenges of Moving from Batch to Flow for the Synthesis of
HMX and 2,4,6- Trinitroethylbenzene (TNEB)*
Declan H. Williams, Robert Claridge (UK)

8:40 I-3 *Effects of Micron-Sized Silicon Dioxide Particles on the Sensitivity
of PETN*
Rebekah L. Travis, Robert E. Ferguson, Claire E. O'Malley,
Steven F. Son, Daniel R. Guildenbecher (USA)

9:00 I-4 *Small Scale Impact Sensitivity Testing of Energetic Materials under
Temperature and Relative Humidity*
Romuald Van Riet, Alexane Esposito, Christopher Hollands,
Christelle Collet (BELGIUM)

Break/Posters 9:20 - 9:50

Session J: Material Environmental Effects

Session Chair: Dr. Joost van Lingen

9:50 J-1 *A Thermodynamic Connection Between Electrochemical and
Pyrotechnic Reactions*
Anthony P Shaw

10:10 J-2 *Investigation of Nitrogen-rich Heterocycles as Environmentally
Friendly Pyrotechnical Compounds*
Alexander Schweiger, Thomas M. Klapötke (GERMANY)

10:30 J-3 *PFAS in Energetics*
William S. Eck, Ph.D., Brian Hubbard (USA)

10:50 J-4 *Navigating Regulatory Complexity and Addressing Educational
Gaps in the Energetics Field: Challenges and Opportunities*
Lea Davis, Dr. Vilem Petr (USA)

11:10 J-5 *Energetic Composite Nanomaterials Based on Activated Carbon
Filled with Oxidizing Agents*
Romuald Van Riet (BELGIUM)

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

POSTERS

- P-1 *120mm Tank Ammunition Tracer System Design Improvements*
John Adams (USA)
- P-2 *High Throughput Initiation Threshold Characterization of BNFF*
Will Bassett (USA)
- P-3 *An Investigation of Flammability in Low-GWP Refrigerants for Military Applications*
Claire O'Malley, Rebecca D. Lu, Steven F. Son, Davide Ziviani (USA)
- P-4 *Determining Hydrogen Content in Titanium Hydrides*
Doinita Neiner, Ronald Goeke, Russel Jarek, Danielle Hartstein, Steward Youngblood, Michael Thomas, Daniel C. Bufford (USA)
- P-5 *Application of NATO AOP-4147 for the Compatibility Testing of High Explosives*
Charlotte Shailes (UK)
- P-6 *Pyrotechnics Automation Summary*
Marcin Rosol (USA)
- P-7 *Mesoscale Packing Models of Multi-Formulation Ammonium Perchlorate Composite Propellant with Different Burning Rates*
James I. Plotzke, Cameron W. McCoy, Nicholas R. Torgerson, Monique S. McClain (USA)
- P-8 *Cure Characteristics of Novel Polymer-Bonded Explosive Molding Powder*
Ismar Chew, Monique McClain, Ellen Ma (USA)
- P-9 *Formulation and Characterization of Metal Filled Polymer Energetics*
Trigg S. Peasley, Lori J. Groven (USA)
- P-10 *Particle Distribution Measurement of Pyrotechnic Mixtures using High Resolution Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopic (EDS) Imaging*
Adam Pimentel, Robert Knepper (USA)
- P-11 *Exploring Rheology and Combustion of MgB₂ Catalyzed Ammonium Perchlorate Composite Propellant*
Jake Martinelli, Lori J. Groven (USA)
- P-12 *Rheological Assessment Towards Conformable Pyrotechnic Delays*
Alyssa Robinson, Lori J. Groven (USA)

Session C: Analytical Techniques: Material Characterization Methodologies

Session Chair: Chris Csernica

- 1:20 C-1 *Apparatus and Method for High-Throughput Screening of Pyrotechnic Compositions*
Nicholas E. Carlucci, Anthony P. Shaw, Mark D. Motyka, Jay C. Poret, Kelsey M. Westerkamp (USA)
- 1:40 C-2 *Laser Induced Breakdown Spectroscopy (LIBS) Efficacy in Hydrogen Quantification in Metal Hydrides*
Stewart Youngblood, Doinita Neiner, Ronald Goeke, Russell Jarek, Danielle Hartstein, Michael Thomas, Daniel C. Bufford (USA)
- 2:00 C-3 *Pressure Resistant Designs to Withstand Hydrogen-Oxygen Deflagration to Detonation Transitions: Experimental Evaluation and Numerical Modeling Validation*
Greg Dutro, Scott Davis, John Pagliaro, Mohsen Sanai (USA)

BREAK/POSTER SETUP 2:20 p.m. - 2:40 p.m.

Session D: Material Reactivity: Formulations

Session Chair: Maciej Puszynski

- 2:40 D-1 *The Effects of Oxygen Content in Strontium Peroxide on Igniters*
Jamie Lee, Christopher Csernica (USA)
- 3:00 D-2 *Janus-type Hypergolic Fuels for Hybrid Systems Using H₂O₂ and HAN-based Oxidizers*
Michael Gozin, Natan Petrutik, Ilia Kaminker, Eli Flaxer, Daniel Shem-Tov, Tsabar Giladi, Yossi Bar-Bechor, Jagadish Das (ISRAEL)
- 3:20 D-3 *Graphene Oxide's Role in Aluminum Combustion: A Study on Oxygen-to-Carbon Ratios*
Sebastian Yongsan Quek, Wenbin Gong, Jun Jing Teh, Sreekumar Pisharath, Huey Hoon Hng, Kwan Wee Tan (SINGAPORE)

6:00 p.m. to 10:00 p.m.

*Picnic Mixer in the Outdoor Special Events Pavilion
Everyone is invited; including children, friends, etc.*

Tuesday, 7/16/2024

Session E: Material Reactivity: Explosives

Session Chairs: Alex Schweiger & Dr. Magdalena Rusan

- 8:00 E-1 **INVITED SPEAKER - Troy Gardner, Testing & Classifications Manager, Safety Management Services, Inc.**
Summary of SMS's Test Results, Findings and Recommendations from the Five-year U.S. DOT PHMSA Thermite Research Project
- 8:50 E-2 *TKX-50 in Thermobaric Formulations*
Thomas M. Klapötke, Stanislaw Cudzilo, Waldemar A. Trzciński, Józef Paszula (GERMANY)
- 9:10 E-3 *High-Pressure Shock-Tube Experiments to Study the Response of Building Façade Materials*
Mohsen Sanai, Sean Cooper, Waylon Weber, Joe Crepeau (USA)
- 9:30 E-4 *Deflagration to Detonation Transition Test on Mixed HMX – LLM105 Explosive using a High Containmentment Steel Tube*
E. Testard, A. Beaucamp, A. Keromnes-Wuillaume, V. Mineau, A. Morancey, E. Pionneau (FRANCE)

Break/Posters 9:50 a.m. - 10:10 a.m.

Session F: Analytical Techniques: Material Properties

Session Chair: Prof. Lori Groven

- 10:10 F-1 *Investigation of Reaction Processes in Aluminized Blast Explosives*
J. Keith Clutter, Mike Hobbs (USA)
- 10:30 F-2 *Simultaneous Measurements of Heat Flow and NO and NO₂ Gas Concentrations During Decomposition of Double Base Propellants*
Jan Puszynski, Jacek Swiatkiewicz, Daniel Perkins, Neha Mehta (USA)
- 10:50 F-3 *Energetic Properties of Dianhydrohexitol Dinitrates*
Rafal Lewczuk, Marcin Hara, Martyna Niedolistek, Józef Paszula, Mateusz Gratzke, Dominika Sobczuk, Weronika Rodzoś (POLAND)
- 11:10 F-4 *An Investigation into PETN Acidity using Heat Flow Calorimetry*
A. F. Macdonald, J. Mansell, A. J. McMorris (UK)

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

Session G: Material Processing: Synthesis

Session Chair: Alex Tappan

- 12:50 G-1 *BERNIE DOUDA YOUNG SCIENTIST AWARD WINNER*
Ryosuke Omori
Presented by Dr. Magdalena Rusan, Vice President, IPS
- 1:00 G-2 *Combustion Characteristics of Energetic Ionic Liquids using an Electrolysis Ignition Combustor*
Ryosuke Omori, Noboru Itouyama, Kento Shiota, Yu-ichiro Izato, Atsumi Miyake (JAPAN)
- 1:20 G-3 *Rapid Synthesis of Fuel: Oxidizer Composite Crystals for Energetic Applications*
Tristan W. Kenny, Lori J. Groven (USA)
- 1:40 G-4 *An Optimized and Safe Synthesis of DBX-1*
Dr. Braja Pradhan, Neha Mehta, Keyur Patel (USA)
- 2:00 G-5 *Synthesis and Characterization of the Energetic Plasticiser Bu-AENA*
Stefan Ek, Jonas Johansson, Mona Brantlind, Marita Sjöblom (SWEDEN)
- 2:20 G-6 *Structural Reactives via Coupled Cold-spray and Friction Stir Processing*
Shakole M. Rugh, Michael Carter, Grant Crawford, Lori J. Groven

BREAK/POSTERS 2:40 p.m. – 3:00 p.m.

Session H: Material Processing: Mixing, Nitration & Nitrolysis

Session Chair: Dr. Stefan Ek

- 3:00 H-1 *Flow Nitration of Cellulose Powders*
Jos van den Elshout, Joost van Lingen, Denise Meuken, Mark Fuller, Lee Goetz, Richard Bouma (NETHERLANDS)
- 3:20 H-2 *New Mixing Technologies for Pyrotechnic Composition Manufacture*
Mark Bradley (UK)
- 3:40 H-3 *The 15N-Nitro Labeling of α -Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) by the Nitrolysis of Unenriched 1,5-diacetyloctahydro-3,7-dinitro-1,3,5,7-tetrazocine (DADN-ue) using a H15NO₃ and Polyphosphoric Acid (PPA) System*
Hope T. Sartain, Sheana Schneidereit, Kevin J. Pedersen, Andrew J. Horan, Benjamin P. Wilkins (USA)
- 4:00 H-4 *Particle Deposition for Energetic Materials*
Andrew Bok, Monique McClain (USA)

4:20 p.m. - 6:30 p.m. Poster Session in the Aztec room