

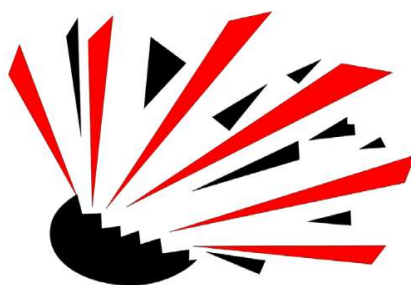
UNIVERSITY OF PARDUBICE

Faculty of Chemical Technology, Institute of Energetic Materials

PROGRAM

of the 26th seminar

**NEW TRENDS IN RESEARCH
OF ENERGETIC MATERIALS**



NTREM 2024

Pardubice, Czech Republic, April 17th – 19th, 2024

<http://www.ntrem.com>

intended as a meeting of students, postgraduate students, university teachers and young research and development workers, with interest in energetic materials

26th INTERNATIONAL SEMINAR
“NEW TRENDS IN RESEARCH OF ENERGETIC MATERIALS”
www.ntrem.com

is supported by:



Austin Powder, Vsetin, Czech Republic



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Explosia, Pardubice, Czech Republic



Faculty of Chemical Technology, University of Pardubice, Czech Republic



Nicolet CZ s.r.o., Praha, Czech Republic



Office of Naval Research Global, London, UK (conference grant)



OZM Research, Bliznovice, Czech Republic



Sellier & Bellot, Vlasim, Czech Republic



SSE Explo, Tuchorice, Czech Republic



US Army Combat Capabilities Development Command, (conference grant)

NTREM is an international meeting of students and early career researchers who are involved in the fundamental understanding, development, technology, industry or application of energetic materials. The seminar enables the presentation of research and allows feedback and interaction with senior, well established experts in the field. In addition, participants will meet and form networks enabling them to communicate amongst each other. It is expected that the seminar will help career progression. The Seminar is intended to provide a pleasant and welcoming atmosphere where exchange of professional experiences goes along with building of strong personal relations among young specialists working in the field of EM.

Papers should not only describe research work itself, but should also demonstrate awareness of the context and background for the research.

The seminar is organized by staff members of the Institute of Energetic Materials University of Pardubice and in accordance with the tradition of previous meetings will take place at the University Hall.

The official language of the seminar is **English** and all contributions shall be presented and written exclusively in the English language.

Registration fee: 200 € paid on spot.

Registration: registration of participants will take place at the University Hall:

April 16 th	16:00 - 18:00	<u>with welcome snack at the University Hall</u>
April 17 th	07:30 - 09:00	

Proceedings of the presented contributions will be prepared by the organizers of the seminar by the date of its opening; price of the proceedings will be 3500 CZK (i. e. ~180 \$, 140 €) printed version and 500 CZK (i. e. ~25 \$, 20 €) CD version – the prices are valid at the time of the seminar. The USB with Proceedings will be provided to the main authors and participants of the seminar free of charge.

Please, watch the web site www.ntrem.com for updates

Chairman of the Seminar:

Assoc. Prof. Jiri Pachman

IEM, FCT *University of Pardubice, CR***Chairman of the Scientific Committee:**

Prof. Adam Cumming

*University of Edinburgh, UK***Members of the Scientific Committee:**

Assoc. Prof. Taner Atalar

Tubitak Sage, Turkey

Dr. Manfred A. Bohn

Fraunhofer ICT, Pfinztal, Germany

Prof. Martin Braithwaite

University of Cambridge, UK

Prof. Jose A. Campos

University of Coimbra, Portugal

Dr. David Chavez

Los Alamos National Laboratory, NM, USA

Dr. Ruth Doherty

Energetics Technology Center, Indian Head, Maryland, USA

Dr. Stefan Ek

FOI, Stockholm, Sweden

Prof. Michael Gozin

University of Tel Aviv, Israel

Prof. Antoine van der Heijden

TNO, Rijswijk, Netherlands

Prof. Thomas Klapötke

Ludwig-Maximilians-Universität München, Germany

Prof. Pavel Konečný

University of Defense, Brno, CR

Prof. Michel Lefebvre

Royal Military Academy, Brussels, Belgium

Prof. Jimmie Oxley

University of Rhode Island, Kingston, USA

Dr. Davin Piercey

Purdue University, West Lafayette, USA

Dr. William Proud

Imperial College London, United Kingdom

Prof. Karl Rink

University of Idaho, Moscow, USA

Prof. Traian Rotariu

Military Technical Academy, Bucharest, Romania

Prof. Muhamed Sućeska

University of Zagreb, Zagreb, Croatia

Prof. Raphaël Terreur

Université Claude Bernard, Lyon, France

Prof. Waldemar A. Trzeciński

Military University Technology, Warsaw, Poland

Prof. Abbaraju Venkataraman

*Gulbarga University, Kalaburagi, India***Organizing Committee**Chairman of the Committee:

Dr. Marcela Jungova

*IEM, FCT, University of Pardubice, CR*Members of the Committee:

Dr. Jakub Selesovsky

IEM, FCT, University of Pardubice, CR

Dr. Iva Ulbrichova

*Dean Office, FCT, University of Pardubice, CR*Organizing committee of NTREM:

Institute of Energetic Materials
 Faculty of Chemical Technology
 University of Pardubice
 532 10 Pardubice
 CZ, European Union

Phone: (+420) 46 603 8023
E-mail: seminar@ntrem.com

Affiliated activities:

The first meeting of the **SCIENTIFIC COMMITTEE** will be carried out on Tuesday, **April 16th, 2024**, at 18:00 in the Restaurant “**Pod Kunětickou horou**” (departure will be from the hall at 16:00), the second one on Thursday, **April 18th, 2024**, at 16:00 in the University Hall.

A friendly get-together for NTREM participants will be carried out on Thursday, April 18th, 2024 at 18:30, in the House of Technology, Pardubice.

LECTURE PROGRAM OF THE 26th NTREM – WEDNESDAY APRIL 17th

07:30 - 09:00 **REGISTRATION**

9:00 **ORGANIZATION REMARKS AND SEMINAR OPENING**

1. Session

Chairman: Dr. Ruth Doherty
 (Energetics Technology Center, Indian Head, Maryland, USA)

MEETING OF SPEAKERS WITH CHAIRMAN

- 09:20** Synthesis of new high energy molecules: Focus on one tetrazole derivative and generation of new structures
Lucas Blanck, Thibaud Alaime, Genevieve Eck, Rachid Baati *p. 36*
- 09:40** Synthesis and characterization of ¹³C isotopically labeled ¹³C₂-FOX-7 (1,1-diamino-2,2-dinitroethylene)
Jasmin T. Lechner, Thomas M. Klapötke *p. 106*
- 10:00** Synthesis, characterization and energetic performance of a new copper complex based on 3,4,5-trinitro-1H-pyrazole
Ashfaq Afsar, Xiaojiao Liu, Carole A. Morrison, Colin R. Pulham, Patrick McMaster *p. 6*
- 10:20 - 10:40** **COFFEE BREAK**
- 10:40** Amine oxidation under challenging conditions: Implementation of a flow-chemistry procedure for 3,4-dinitrofurazan synthesis
Patrick Lieber, Uwe Schaller, Thomas M. Klapötke *p. 111*
- 11:00** Electrochemical synthesis of energetic materials and high-nitrogen compounds
Joseph Yount, Davin Piercey, Mathias Zeller *p. 224*
- 11:20** Radiative and reactive coupling of lightning to electro – explosive devices in storage
Willem Q. Boon *p. 41*
- 11:40** Evaluating the effect of structural reorientation to thermochemical and energetic properties of 1,4-Diamino-3,6-dinitropyrazolo[4,3-c]pyrazole
Lamla Thungatha, Conrad Mahlase, Lisa Ngcebesha *p. 211*

12:00 – 14:00 **LUNCH BREAK**

2. Session

Chairman: Prof. Michael Gozin
(University of Tel Aviv, Israel)

- 14:00** A high-pressure structural study of potassium dinitramide
Chan Qi Feng, Craig L. Bull, Nicholas P. Funnell, Christopher J. Ridley, Carole A. Morrison, Cameron J. G. Wilson, Angela Fong, Colin R. Pulham p. 161
- 14:20** Tailoring the properties of ADN using co-crystallisation
Akachai Khumsri, Carole A. Morisson, Colin R. Pulham, Stuart R. Kennedy p. 100
- 14:40** Crystallization agents for ADN melting droplets
Ligia Radulescu p. 172

15:00 – 15:20 COFFEE BREAK

- 15:20** Detonation simulant of TATP as a donor charges in a detonation train
Djamal Belmehdi, Moulai K. Boulkadid, Michel H. Lefebvre, Romuland van Ried p. 12
- 15:40** Ballistic modifiers for nitrocellulose gunpowder
Stepan Frebort, Jakub Moravec, Zdenek Jalovy p. 68
- 16:00** Composition for cooling of pyrotechnically generated hot aerosols
Kavita Devi, Amir Saxena, Prem Chand, Braham Prakash, Rejesh Kumar Tanwar, Arvind Kumar p. 62

17:00 – 18:30 GUIDED TOUR THROUGH AUTOMATICKÉ MLÝNY (HISTORICAL MILLS)
(max. 60 persons, based on the registration)

LECTURE PROGRAM OF THE 26th NTREM – THURSDAY APRIL 18th

3. Session

Chairman: Prof. Traian Rotariu
(Military Technical Academy, Bucharest, Romania)

MEETING OF SPEAKERS WITH CHAIRMAN

- 08:00** Laser-driven flyer experiments: analogy with Gurney High Explosive plate acceleration model
Baptiste Reynier, Ondrej Zeman, Julien Le Clanche, Jiri Pachman, Jean Marc Chevalier, Lorenzo Taddei, David Hebert, Michel Arrigoni p. 176
- 08:20** Characterizing the shock sensitivity of HMX using laser-driven flyers
Julie Morand, Philippe Hebert, Steven Kerampran, Michael Arrigoni p. 125
- 08:40** Study of explosion-generated plasma, it's velocity and effects upon collision
Stepan Jirman, Jindrich Kucera, Jakub Selesovsky, Jiri Pachman p. 88

09:00 Excitation instead of heat and impact: a photocatalytic viewpoint on the laser ignition of energetic materials
Anton Zverev p. 237

09:20 Experimental characterization of emulsion explosives with inert additives
João Pimenta, Joana Quaresma, Ricardo Mendes p. 152

09:40 – 10:00 **COFFEE BREAK**

10:20 Towards a machine learning method to rationalise the impact sensitivities of energetic materials
Heather M. Quayle, Jack M. Hemingway, Colin R. Pulham, Carole A. Morrison p. 166

10:40 Dive into the thermal realms: Analyzing combustion and temperature characteristics in silicon-based compositions for time-delay detonators
Marcin Gerlich, Waldemar Trzcinski, Marcin Hara p. 73

4. *Poster Session*

Chairman: Prof. Thomas Klapötke
(Ludwig-Maximilians-Universität München, Germany)

11:00 **2 MINUTES ORAL POSTER INTRODUCTION (2-3 SLIDES PRESENTATION)**

12:20 **GROUP PHOTOGRAPHY**

12:30 – 14:00 **LUNCH BREAK**

P1 High stability N-rich energetic materials based on 5,5'-(1H-pyrazole-3,5-diyl)bis(4H-1,2,4-triazole-3,4-diamine)
Guofeng Zhang, Zhiwen Ye p. 504

P2 A theoretical exploration of hexazine anion $[N_6]^{4-}$
Shuaijie Jiang, Pengcheng Wang, Ming Lu p. 395

P3 Energetic salts based on 5-(5-Amino-1H-1,2,4-triazole-3-yl)-1H-tetrazole with good thermal stability
Yagi Qin, Pengcheng Wang p. 470

P4 Dynamic vapor sorption study of MTX-1 alkali metal salt hydrates
Jakub Mikulastik, Robert Matyas, Libor Cervenka, Martin Adam p. 426

P5 Synthesis and energetic characterization of borane-amines on high-nitrogen heterocycles
Nicholas Scherschel, Davin Piercey p. 475

P6 Innovative coagglomeration method for producing the energy–safety balanced cocrystals of attractive nitramines
Veerabhadragouda Patil, Svatopluk Zeman p. 449

P7	Rheology study of HTPB prepolymer suspensions with different metal micro- and nano- sized particles <i>Danica Bajic, Ivan Dimitrijevic, Mirjabna Krstovic, Mladen Timotievic, Bojana Fidanovski, Jovica Bogdanov, Slavko Mijatov</i>	p. 295
P8	Influence of fillers on the mechanical and thermal characteristics of rocket motor liners based on HTPB <i>Emre Erten, Taner Atalar, Cevdet Kaynak</i>	p. 366
P9	The effect of graphene oxide (GO) on the bulk crystallization of ammonium nitrate <i>Fatema Alhosani, Ranko M.Vrcelj</i>	p. 258
P10	Stability of the extruded double base (NC/DEGDN) modified with graphene oxide (GO) <i>Maria Alnaqbi, Nathalie Mai, Jeff Pons</i>	p. 277
P11	The influence of magnesium liner on artillery shell explosive disposal. <i>Dana Andrea Alexandra Pîrvoi, Liviu Cristian Matache, Adrian Nicolae Rotariu, Cosmina Maria Aonicesei, Razvan Marian Mircioaga</i>	p. 459
P12	Investigating the effects of natural aging on PBXN-111 <i>Aeysha Alkatheeri, Nathalie Mai, Guillaume Kister, Samira Belghiche</i>	p. 268
P13	Recent developments on energetic di- and trisubstituted cubanes <i>Andreas Bartonek, Thomas M. Klapötke, Burkhard Krumm</i>	p. 309
P14	Study of the RDX photolysis degradation products <i>Zoran Bajic, Jovica Bogdanov</i>	p. 304
P15	Assessing chemical inter-reactivity of high explosives. An outline for an adequate way <i>Manfred A. Bohn</i>	p. 321
P16	Innovative perspective on measuring the sensitivity of boron potassium nitrate to different stimuli <i>Danillo Fernando Vianna Cantini, Jiri Pachman, Vojtech Pelikan</i>	p. 487
P17	Identification and assessment of potential thermostable and powerful explosives <i>Mathieu Daniel, Kevin Ruffray, Lydia Benkaidali, Clement Wespiser, Samia Aci-seche, Eric Pasquinet, Didier Mathieu, Pascal Bonnet</i>	p. 348
P18	OPTIMEX: Detonation pressure measurement using stacked PTFE sheets <i>Martin Kunzel, Jindrich Kucera, Stepan Jirman, Filip Sazecek, Jiri Pachman</i>	p. 406
P19	Experimental evaluation of detonation parameters in a single test <i>Ricardo Mendes, Joao Pimenta, Joao Mota, Joana Quaresma</i>	p.418
P20	Modeling and application of civil explosives in different types of soil <i>Ivana Dobrilovic, Denis Tezak, Mario Dobrilovic, Muhamed Suceska, Sinisa Stankovic, Vinko Skrlec, Vjceslav Bohanek</i>	p. 360
P21	Experimental research on TNT equivalent of different explosives based on air shock wave <i>Jovica Bogdanov, Zoran Bajic, Danica Bajic, Radoslav Sirovatka, Mirjana Krstovic</i>	p. 314
P22	A comparison of the acoustic performance of flash compositions used in firecrackers <i>Petr Kuna, Ondřej Zeman, Vojtech Pelikan</i>	p. 402

P23	Dynamic calibration and implementation of PVDF gauges for shockwave measurements <i>Julien Le Clanche, Martin Monloubou, Lorenzo Taddei, Steven Kerampran, Jeremie Tartiere, Louis Morge-Rollet, Michel Arrigoni</i>	<i>p. 412</i>
P24	60 mm thermobaric mortar round fragmentation effect <i>Jana Vlhova</i>	<i>p. 495</i>
P25	Towards finding lead-free ballistic modifiers in double base propellants using computational modelling <i>Harvey J. Newman, Lisette R. Warren, Colin R. Pulham, Carole A. Morrison</i>	<i>p. 442</i>
P26	Influence of erosion-induced geometry changes on the flow vented vessel experiments <i>Thomas Heidebrecht, Philip Pietrek, Veronica Kuchenreuther-Hummel</i>	<i>p. 381</i>
P27	Exploring the mechanical characteristics of basebleed propellants: A comparative study <i>Bengi Ezgi Çelik Fidanci, Taner Atalar, Ali Fatih Zeybek, Halil Ipek</i>	<i>p. 342</i>
P28	Assesment of a new solid thermobaric composition used for warheads loading <i>Cosmina Maria Aonicesei, Liviu Cristian Matache, Adrian Nicolae Rotariu, Andea Alexandra Pîrvoi, Razvan Marian Mircioaga</i>	<i>p. 289</i>
P29	Influence of particle size on the thermal-mechanical properties of composite propellants <i>Safea Alblooshi, Guillaume Kister, Peter Wilkinson</i>	<i>p. 248</i>
P30	Study of the gun powders ignition by laser beam in closed vessels <i>Razvan Marian Mircioaga, Bogdan Pulpea, Adrian Nicolae Rotariu, Florin Marian Dirloman</i>	<i>p. 435</i>
P31	LOVA propellants based on RDX and GAP energetic plasticizers <i>Dorin Holeoleo, Traian Rotariu, Florin Marian Dirloman, Adrian Nicolae Rotariu, Ioana Barcan</i>	<i>p. 387</i>
P32	Development and characterization of novel polyurethane formulations for composite rocket propellants <i>Florin Marian Dirloman, Traian Rotariu, Gabriela Toader, Ovidiu – George Iorga, Aurel Diacom</i>	<i>p. 352</i>
P33	Risks in ammunition clean-up of the Black sea aquatoria <i>Radi Ganev</i>	<i>p. 377</i>
P34	Synthesis, thermal and spectroscopical properties of the cocrystal CL-20-MDNT <i>Peter Schultz, Michael Herrmann, Luisa Wartner</i>	<i>p. 483</i>
P35	Investigation of the ability of nonel shock tubes to generate high pressure shock waves <i>Ondrej Zeman, Petr Kuna, Vojtech Pelikan, Jiri Pachman</i>	<i>p. 231</i>
16:30	SCIENTIFIC COMMITTEE MEETING AT LECTURE HALL	
18:30	SOCIAL EVENT - BANQUET AT HOUSE OF TECHNOLOGY	

LECTURE PROGRAM OF THE 26th NTREM – FRIDAY APRIL 19th

5. Session

Chairman: Prof. Adam Cumming
(University of Edinburgh, UK)

MEETING OF SPEAKERS WITH CHAIRMAN

09:00 Toward estimating explosivity
Jimmie Oxley, Noah Scarpelli, James Smith p. 144

09:20 Coagglomerated Crystals of Attractive Nitramines in Nitrocellulose Gunpowder:
A Technological Application
Miroslav Novak, Veerabhadragouda Patil, Ladislav Velehradsky, Karel Kubat, Svatopluk Zeman p. 134

09:40 Experimental analysis of liquid jet propulsion systems effects on IEDs casing materials
Alexandru Casapu, Marin Lupoe, Daniel Constantin, Dumitru C. Berechet p. 50

10:00 Experimental investigation on door breaching using explosives and its effects on room occupants
Marin Lupoe, Catalin Baci, Anabella Cotovanu, Alexandru Casapu p. 118

10:20 – 10:40 COFFEE BREAK

10:40 Improving the precision of blast-induced seismic effect measurement results
Sinisa Stankovic, Ivana Dobrilovic, Davorin Jurenec, Mario Dobrilovic p. 205

11:00 Synthesis of graphene oxide/nano-silica composite and its application for decontamination of 2,4-dinitroaniline from water
Bharti, Rekha Mann, Pramod Kumar Rai p. 26

11:20 Evaluating the Comparative Potential of two Indigenous Microbial Strains for Degradation of 2,4,6- Trinitrotoluene (TNT) and their Biotransformation Mechanisms
Pritam Sangwan, Shruti Kaushik, Kapil Kumar, Pramod Kumar Rai p. 195

11:40 A picture of the scientific explosives community before artificial intelligence takes over everything
Tomasz Salacinski p. 186

12:00 PRIZE AWARDS & CLOSING THE SEMINAR



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MAIN VENUE

UNIVERSITY HALL

(Aula Arnošta z Pardubic)

Studentská 519, Pardubice

<https://mapy.cz/s/larunemona>

50.0496653N, 15.7665203E



②

BANQUET

HOUSE OF TECHNOLOGY

(Dům Techniky)

Náměstí Republiky 2686,
Pardubice

<https://mapy.cz/s/hebuvenade>

50.0372314N, 15.7770425E



③

PARKING HOUSE

IN TOWN

Parkovací dům

Karla IV. 2749, Pardubice

<https://mapy.cz/s/muzekacore>

50.0362419N, 15.7793439E

Bus or Trolleybus - more info at www.dpmp.cz

From the Main Train Station to University Hall – line 3, 17, 33 (Polabiny Hradecká – stop No. 6)

From the Main Train Station to House of Technology – line 6, 8, 9, 12 (Náměstí Republiky – stop No. 4)

