

Program

50th International Annual
Conference of the Fraunhofer ICT
June 25 – 28, 2019

Convention Center, Gartenhalle,
Karlsruhe, Germany

Energetic Materials

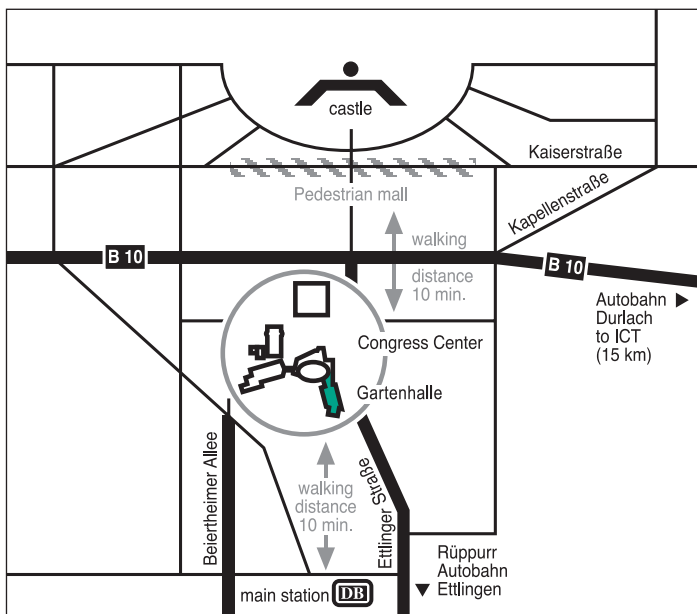
Past, Present
and Future



Fraunhofer
ICT

Karlsruhe City Plan

How to find the venue



Karlsruhe is located 120 km south of Frankfurt (Main)/Frankfurt International Airport just beside the Autobahn A5, and is also connected to Frankfurt via the Intercity Express Train ICE.

Additional airports are:
Strasbourg (F) (approx. 100 km) and Stuttgart (D) (approx. 90 km)

Congress Center Karlsruhe
Festplatz 9
76137 Karlsruhe
Germany

50th International Annual Conference of the Fraunhofer ICT

Energetic Materials – Past, Present and Future

For 50 years the International Annual Conference of the Fraunhofer ICT has given scientists in the global energetic materials community from all over the world a forum to share and discuss their research. Some of the research goals pursued 50 years ago – such as enhanced performance and safety or low production costs – are as relevant today as they were in the past. However, new research trends have also emerged. For example, increased awareness of environmental impact and toxic effects on humans has stimulated a plethora of research into green alternatives to traditional energetic materials like lead azide.

Alongside these shifts in research objectives, the methods and materials used have also changed considerably over the years. New methods for the synthesis and processing of energetic materials, such as micro reactor technology or 3D printing of high explosives, have been developed or are the topic of current research. New systems under investigation, such as co-crystallized high explosives or metallic nano-laminates, have the potential to create energetic materials with a performance tailored to specific applications. Together with new or improved experimental techniques such as high-speed video, fast spectrometry or transient interferometry methods like photonic doppler velocimetry, new computer models and simulation capabilities have enabled scientists to design energetic materials with enhanced capabilities and efficiency in technical applications, and to increase their knowledge and understanding of energetic materials in ways barely imaginable 50 years ago. It will be exciting to see what the future holds for us.

From synthesis and processing, modelling and simulation through to experimental characterization and from basic research through to technical applications, the 50th International Annual Conference of the Fraunhofer ICT will continue to welcome contributions relating to almost all aspects of energetic materials research.

Scientists participating in ICT's 50th International Annual Conference have the opportunity to present and discuss their research with experts from all over the world, to stay up to date with the latest trends and ideas in the energetic materials community and to contribute to the future of the science of energetic materials.

Chairman of the Conference
Dr. Sebastian Wurster
Fraunhofer ICT, Pfinztal, Germany

General Information

REGISTRATION

Please return the enclosed registration form or register online:

www.ict.fraunhofer.de/jata2019

Registration fees (incl. proceedings, coffee breaks, lunch), depending on arrival of the registration at the ICT:

- Registration up to **June 7th**:
€ 990,-- (incl. 19% VAT)
- Registration up to **June 17th**:
€ 1.250,-- (incl. 19% VAT)

Participation cannot be guaranteed for registrations arriving after June 17th, 2019.

The fee must be paid **upon receipt of the invoice** by bank transfer to the account given on the invoice

CANCELLATION POLICY

€ 600.-- will be charged for cancellations after **June 17th, 2019**.

No-shows will be charged the whole fee.

ACCOMMODATION

Online: www.ict.fraunhofer.de/accommodation2019

CONFERENCE OFFICE

Foyer of the GARTENHALLE.

Open from Tuesday, June 25, 16.00 h till Friday, June 28, 14.30 h **during the Conference** and may be reached by

Phone +49-(0)7 21/ 37 20 – 60 00

CHECK IN/WELCOME RECEPTION

Please check in at the Conference Office on **Tuesday, June 25, between 16.00 and 20.00 h.**

All participants are cordially invited to the **Welcome Reception** on the same day, starting at **18.00 h** in the foyer of the GARTENHALLE.

CONFERENCE LANGUAGE

English

GET-TOGETHER AND VISIT OF THE INSTITUTE

The Fraunhofer ICT can be visited on **Thursday, June 27** in the evening. There will be several short tours of the Institute, accompanied by a **Get-together Party** with draught beer, barbecue and fireworks (after sunset). Please **mark on your registration form** whether you wish to participate.

Tuesday, June 25

18.00 – 20.00 **Welcome Reception**
Foyer of the GARTENHALLE

Wednesday, June 26

1st Session – CELEBRATING 50 YEARS INTERNATIONAL ANNUAL CONFERENCE OF FRAUNHOFER ICT

Chair: S. Wurster
Fraunhofer ICT, Pfinztal, DE

- 9.00 **VC1 Welcome Address**
W. Eckl
Fraunhofer ICT, Pfinztal, DE
M. Gebauer
Federal Ministry of Defence of the Federal Republic of Germany, Bonn, DE
- 9.20 **VC2 50 YEARS OF ADVANCES IN ENERGETIC MATERIALS SCIENCE**
R. Simpson
Lawrence Livermore National Laboratory, Livermore, US
- 10.00 **VC3 HALF A CENTURY OF EU RESEARCH ON ENERGETIC MATERIALS**
H. Östmark, C. Eldsäter
FOI, Stockholm, SE
A. van der Heijden, W. de Klerk
TNO Defence, Rijswijk, NL
V. Weiser, M. Herrmann
Fraunhofer ICT, Pfinztal, DE
- 10.40 **Coffee Break**

2nd Session – SYNTHESIS / NEW MATERIALS

Chair: C. Eldsäter
FOI, Stockholm, SE

- 11.10 **V1 MODIFICATION OF HTPB WITH OCTYL-1-AZIDE: CHARACTERIZATION OF CHEMICAL STRUCTURE AND VISCOELASTIC PROPERTIES**
M. Ferrapontoff Lemos
Brazilian Navy Research Institute, Rio de Janeiro, BR
L.C. Mendes
Instituto de Macromoleculas, Rio de Janeiro, BR
M. Bohn
Fraunhofer ICT, Pfinztal, DE

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- 11.30 **V2** **SYNTHESIS AND CHARACTERIZATION OF 2,4,6-TRIAMINO-1,3,5-TRIAZIN-1,3-DIOXIDE**
Jiarong Zhang
Xian Modern Chemistry Research Institute, Xian, CN
Fuqiang Bi, Bozhou Wang
State Key Laboratory of Fluorine & Nitrogen Chemical, Xian, CN
- 11.50 **V3** **SYNTHESIS OF NANODIAMOND BASED ENERGETIC COMPOSITES**
M. Guillevic, V. Pichot, D. Spitzer
ISL, Saint-Louis, FR
- 12.10 **V4** **THE SYNTHESIS OF LOW SENSITIVITY HIGH ENERGY EXPLOSIVES TKX-50**
Pai-Jung Chang, Chan-Yuan Ho, Tsair-Feng Lin,
Yan-Lin Wang, Ching Shen
National Chung Shan Institute of Science and Technology,
Taoyuan, TW
- 12.30 **Lunch Break**

3rd Session – EXPLOSIVES / DETONATION

Chair: M. Graswald

TDW MBDA, Schrobenhausen, DE

- 14.00 **V5** **BOOSTER RELIABILITY TEST MATRIX**
E. Francois
Los Alamos National Laboratory, Los Alamos, US
- 14.20 **V6** **EXPERIMENTAL CHARACTERIZATION OF REACTION THRESHOLDS FOR POLYMER BONDED HIGH EXPLOSIVES UNDER MODERATE MECHANICAL LOADING**
H. Aurich
Fraunhofer EMI, Kandern, DE
N. Heider, V. Denefeld
Fraunhofer EMI, Freiburg, DE
M. Koch
WTD 91, Meppen, DE
- 14.40 **V7** **FRONT CURVATURE RATE STICK EXPERIMENTS OF TATB BASED IHE OVER A WIDE TEMPERATURE RANGE**
Guo Liu-Wei, Liu Yu-Si, Pang Yong, Zheng Xian-Xu
Institute of Fluid Physics CAEP, Mianyang, CN
- 15.00 **V8** **NITROGLYCERINE, AN OLD MOLECULE WHICH CAN TEACH US ABOUT THE FUTURE OF ENERGETIC MATERIALS**
R. Tunnell, D. Tod
QinetiQ Fort Halstead, GB
R. Johnson
Roxel, GB
M. Sloan
DOSG, GB

15.20 **V9 A "UNIVERSAL" COOKOFF MODEL FOR EXPLOSIVES**
M.L. Hobbs, M.J. Kaneshige, W.W. Erikson
Sandia National Laboratories, Albuquerque, US

15.40 **Coffee Break**

4th Session – PYROTECHNICS

Chair: M. Comet
ISL, Saint-Louis, FR

16.00 **V10 ACCELERATED AGING OF POROUS PYROTECHNIC COMPOSITIONS BASED ON NITROCELLULOSE**
J. van den Elshout, M. Zebregs, J. van Lingen, A. den Otter
TNO, Rijswijk, NL

16.20 **V11 PREPARATION AND CHARACTERIZATION OF $\text{Cu}(\text{N}_3)_2/\text{rGO}$ COMPOSITE ENERGETIC MATERIALS**
Liu Xu-Wen, Li Ting-Ting, Hu Yan, Ye Ying-Hua, Shen Rui-Qi
Nanjing University of Science and Technology, Nanjing, CN

16.40 **V12 DEVELOPMENT OF NOVEL ENVIRONMENTALLY BENIGN TUNABLE PYROTECHNIC DELAY SYSTEMS**
D. Perkins, M. Puszyński
Innovative Materials and Processes LLC, Rapid City, US
J. Puszyński
South Dakota School of Mines and Technology, Rapid City, US

17.00 **V13 FRAGMENTATION AND FORMATION OF THE CONDENSED PRODUCTS UNDER COMBUSTION OF TITANIUM PARTICLES IN AIR**
N.S. Belousova, O.G. Glotov, G.S. Surodin
Voevodsky Institute of Chemical Kinetics and Combustion,
Novosibirsk, RU / Novosibirsk State Technical University,
Novosibirsk, RU

17.20 **V14 HIGH PERFORMANCE MODIFICATION OF INFRARED DECOY FLARES**
E.-C. Koch
Lutradyn, Kaiserslautern, DE
S. Knapp
Fraunhofer ICT, Pfinztal, DE

Thursday, June 27

5th Session – MODELING, SIMULATION AND PREDICTION

Chair: R. Gee

Lawrence Livermore National Laboratory, US

- 09.00 **V15 COMPARISON OF SOFTWARE CODES AND DISCRETIZATION SCHEMES FOR MESOSCALE SIMULATION OF DYNAMIC MECHANICAL LOADING OF PBX**
M. Nixon, S. Koundinyan, A. Diggs
AFRL Munitions Directorate, Eglin Air Force Base, US
M. Schmidt
Air Force Office of Scientific Research, Arlington, US
M. Lueck, N. Durr, M. Sauer
Fraunhofer EMI, Freiburg, DE
M. Koch
WTD 91, Meppen, DE
- 09.20 **V16 COUPLING EFFECT OF HEAT AND DEFECT ON THE SHOCK INDUCED CHEMICAL DECAY OF ENERGETIC MATERIALS: A CASE OF REACTIVE MOLECULAR DYNAMICS SIMULATIONS ON 1,3,5-TRINITRO-1,3,5-TRIAZINANE (RDX)**
Chuan Deng, Xianggui Xue, Yushi Wen, Xiping Long, Chaoyang Zhang
Institute of Chemical Materials CAEP, Mianyang, CN
- 09.40 **V17 GENERATION OF VIRTUAL MICROSTRUCTURES OF ENERGETIC MATERIALS BASED ON MICRO-COMPUTED TOMOGRAPHY IMAGES ANALYSIS**
E. Kaeshammer, B. Erzar, S. Belon
CEA DAM, Gramat, FR
P. Dokladal, F. Willot
CMM, Fontainebleau, FR
L. Borne
ISL, Saint-Louis, FR
- 10.00 **V18 MESO-SCALE AND CONTINUUM SIMULATIONS FOR ARRHENIUS REACTIVE BURN MODEL CALIBRATION OF INITIATION IN HEXANITROSTILBENE (HNS)**
J.D. Olles, C. Yarrington, R.R. Wixom
Sandia National Laboratories, Albuquerque, US
G.D. Kosiba
Lawrence Livermore National Laboratory, Livermore, US
- 10.20 **V19 MOLECULAR SIMULATIONS FOR ENERGETIC COMPOSITES: THE ROLE OF INTERFACIAL INTERACTIONS ON MECHANICAL REINFORCEMENT**
Wen Qian
Institute of Chemical Materials CAEP, Mianyang, CN
- 10.40 **Coffee Break**

11.10 **POSTER SESSION**
Chair: R. Doherty
University of Maryland, US

12.30 **Lunch Break**

6th Session – CHARACTERIZATION I

Chair: S. Wilker
BAAINBw, Koblenz, DE

14.00 **V20 APPLICATION OF DATA LOGGERS WITH IMPLEMENTED KINETIC PARAMETERS TO MONITOR THE SHELF LIVES OF ENERGETIC MATERIALS**

B. Roduit, C. Luyet, M. Hartmann
AKTS AG, Siders, CH
P. Folly, A. Sarbach
armasuisse, Thun, CH
A. Dejeaifve, R. Dobson
PB Clermont EURENCO Group, Engis, BE
N. Schroeter, O. Vorlet, M. Dabros, R. Baltensperger
University of Applied Sciences of Western Switzerland,
Fribourg, CH

14.20 **V21 CHARACTERISATION OF XYLITOL PENTANITRATE**

K.-A.S. Stark, C.E. Lenehan, K.P. Kirkbride
Flinders University, Bedford Park, AU
M. Fitzgerald, C. Prior
Defence Science and Technology Group, Edinburgh, AU

14.40 **V22 CHARACTERIZATION AND ACCELERATED AGING CHARACTERISTICS OF THE EXPLOSIVE LLM-105**

A. Gash, H. Mulcahy, G. Guillen, K. Coffee
Lawrence Livermore National Laboratory, Livermore, US

15.00 **V23 COMPARISON OF DIFFERENT METHODS FOR THERMAL DECOMPOSITION OF GUN PROPELLANTS**

M. Heil, C. Müller, J. Hickmann
Fraunhofer ICT, Pfinztal, DE

15.20 **V24 CONTROLLED THERMAL TEST ON EXPLOSIVE BARS**

V. Le Gallo, M. Vaullerin, A. Osmont
CEA DAM, Gramat, FR

15.40 **Coffee Break**

7th Session – CHARACTERIZATION II

Chair: W. de Klerk
TNO, Rijswijk, NL

- 16.00 **V25 CYCLIC RAMAN SPECTROSCOPY OF SOME
 PHASE-STABILIZED AMMONIUM NITRATES**
 A. Toda, S. Date
 National Defense Academy, Yokosuka, JP
 A. Miyake, Y. Izato
 Yokohama National University, Yokohama, JP
- 16.20 **V26 PERMITTIVITY MEASUREMENTS OF MELT CAST
 TNT BASED HIGH EXPLOSIVES**
 B. Rougier, V. Chuzeville
 CEA/DAM, Gramat, FR
 A. Lefrancois
 LAAS-CNRS, Toulouse, FR
- 16.40 **V27 THERMAL DECOMPOSITION CHARACTERISTICS OF
 MIXTURES OF AMMONIUM DINITRAMIDE AND ADDITIVES**
 Jian Zhang, Tenglong Guo, Tingpeng Wang, Dezhu Xu
 Dalian Institute of Chemical Physics CAS, Dalian, CN
- 17.00 – 17.30 **Coffee / Refreshments**
- 17.30 **Bus Departure from Conference Hall to Fraunhofer ICT**
- 18.00 **Get-together Barbecue Party**
approx. 18.30 **Guided Tours** of Fraunhofer ICT
- 22.30 **Fireworks**

Bus transfer to hotels, Karlsruhe City and Main Station will be available (starting 19.00 h) during the whole evening.

We would like to thank ZINK-Feuerwerk GmbH, D-74389 Cleebronn, for sponsoring the fireworks.

Friday, June 28

8th Session – PROPELLANTS

Chair: A. Sättler

Fraunhofer EMI, Efringen-Kirchen, DE

- 9.00 **V28 ADDITIVELY MANUFACTURED SOLID PROPELLANT AND EMBEDDED REACTIVE COMPONENTS**
D.N. Collard, M.S. McClain, T.J. Fleck, R.A. Rahman, T.R. Meyer, S.F. Son
Purdue University, West Lafayette, US
- 9.20 **V29 AMMONIUM DINITRAMIDE**
N. Wingborg
FOI, Stockholm, SE
- 9.40 **V30 EVALUATION OF NITROCELLULOSE (NC) AND GUN PROPELLANTS MADE WITH KRAFT (SULFATE) CELLULOSE**
L.R. Lopez, K. Yang, C. Patel
US Army ARDEC, Picatinny Arsenal, US
- 10.00 **V31 EVALUATION OF TENSILE MECHANICAL PROPERTIES OF COMPOSITE SOLID PROPELLANT BY MEANS OF GENETIC ENGINEERING OF MATERIALS**
Wei Zhang, Xing Zhou, Tong Bao, Lei Deng, Fan Hu, Shi-feng Zhang
National University of Defense Technology, Changsha, CN
- 10.20 **V32 POLYMER BASED INHIBITOR MATRIX FOR SOLID ROCKET PROPELLANTS**
C. Schragen, S. Gebhard, S. Langenbach, S. Meinzel, M. Niehaus
Dynamit Nobel Defence GmbH, Burbach, DE
- 10.40 **Coffee Break**

9th Session – PROCESSING

Chair: M. Heil

Fraunhofer ICT, Pfinztal, DE

- 11.00 **V33 FACILE FABRICATION AND PROPERTIES OF HMX POPCORN BY USING SOLVENT VAPOUR PERMEATION AND REMOVAL**
Yu Liu, Shichun Li, Shiliang Huang, Jinjiang Xu, Jinshan Li
Institute of Chemical Materials CAEP, Mianyang, CN
Zeshan Wang
Nanjing University of Science & Technology, Nanjing, CN
- 11.20 **V34 PLASTIC COATED EXPLOSIVES**
H. Stenmark, M. Mazurek
Eurengo Bofors AB, Karlskoga, SE

- 11.40 **V35 RESONANT ACOUSTIC® MIXING:
PROCESSING AND SAFETY**
M. Andrews, C. Collet
MSIAC, Brussels, BE
A. Wolff
ENSTA Bretagne Engineering School, Brest, FR
C. Hollands
DOSG, Bristol, GB
- 12.00 **V36 THE WAY TOWARDS A CL-20/HMX COCRYSTAL
SCALE-UP**
D. Herrmannsdörfer, M. Herrmann, T. Heintz, P. Gerber
Fraunhofer ICT, Pfinztal, DE
T.M. Klapötke
LMU München, DE
- 12.20 **Closing Remarks**
- 12.30 **Lunch**

POSTER PROGRAM

Posters will be presented during the whole conference. A special **Poster Session** will take place on **Thursday, June 27, 11.10 – 12.30 h**. During this time authors should be present for discussion at their posters in the foyer of the Conference Hall.

P 37 COMBUSTION PERFORMANCES OF MULTI-PERFORATED CURVE-CUT STICK GUN PROPELLANTS

Zi-chao Li, Feng Wang, Guo-tao Liu, Da Li, Yue-juan Yao,
Hui-fang Yu, Qiong-lin Wang, Yuan-bo Zhang, Shao-wu Liu
Xian Modern Chemistry Research Institute, Xian, CN

P 38 DEVELOPMENTS IN SUPERCRITICAL CO₂ FOAMING OF MICROCELLULAR GUN PROPELLANT

Weitao Yang, Rui Hu
Xian Modern Chemistry Research Institute, Xian, CN
Yajun Ding, Sanjiu Ying
Nanjing University of Science and Technology, Nanjing, CN

P 39 HIGH POWER AND LOW SENSITIVITY COCRYSTAL EXPLOSIVE CL-20/CBNT

Xiaopeng Zhang, Shaohua Jin, Kun Chen, Junyi Du, Jinxu Liu, Chuan He,
Shukui Li, Xinya Feng, Haibo Jin, Yanyue Li, Qinghai Shu
Beijing Institute of Technology, Beijing, CN
Fengqin Shang
Gansu Yinguang Chemical Industry Group, Baiyin, CN

P 40 HMX CRYSTAL TOPOGRAPHY INVESTIGATED BY MEANS OF ATOMIC FORCE MICROSCOPY AND CONFOCAL MICROSCOPY

H. Weyrauch, M. Herrmann
Fraunhofer ICT, Pfinztal, DE

P 41 THERMAL ANALYSIS OF TKX-50 BY MEANS OF X-RAY DIFFRACTION

M. Herrmann, U. Förter-Barth
Fraunhofer ICT, Pfinztal, DE

P 42 INVESTIGATION OF THE MICROSTRUCTURE OF ADN-PRILLS USING 2D-X-RAY DIFFRACTION

P.B. Kempa, H. Fietzek, M. Herrmann, T. Heintz
Fraunhofer ICT, Pfinztal, DE

P 43 THERMAL DECOMPOSITION BEHAVIOR BY ReaxFF FOR A MIXED SOLUTION: N-PROPYL NITRATE AND NITRIC ACID SOLUTION

Xie Qiang, Chen Hou-He
Nanjing University of Science and Technology of Chemical Engineering,
Nanjing, CN

- P 44 MODELING OF PARTICLE PACKING UNIT CELL IN COMPOSITE SOLID PROPELLANT BASED ON TWO-STEP ALGORITHM**
Ge Dong, Wei Zhang, Fan Hu, Lei Deng, Xing Zhou, Tong Bao
National University of Defense Technology, Changsha, CN
- P 45 PREPARATION AND PROPERTIES OF NANO-AMMONIUM PERCHLORATE/NITROCELLULOSE POROUS COMPOSITE ENERGETIC PARTICLES**
Xing Zhou, Yang-hong Liu, Wei Zhang, Shi-feng Zhang
National University of Defense Technology, Changsha, CN
- P 46 SYNTHESIS, CRYSTAL STRUCTURES AND THERMAL DECOMPOSITION OF ENERGETIC COORDINATION COMPOUNDS CONSTRUCTED FROM TRANSITION METAL CATIONS AND 3-AMINOFURAZAN-4-CARBOXYLIC ACID**
Wei Liu, Yuangang Xu, Qiang Xie, Houhe Chen
Nanjing University of Science and Technology, Nanjing, CN
- P 47 FACILE PREPARATION AND ENERGETIC CHARACTERISTICS OF CORE/SHELL $\text{CoFe}_2\text{O}_4/\text{Al}$ NANOWIRES THERMITE FILM**
Chunpei Yu, Wenchao Zhang, Ganggang Wu, Bin Hu, Zilong Zheng, Jiahai Ye, Chenguang Zhu
Nanjing University of Science and Technology, Nanjing, CN
Wei Ren, Debin Ni
Shanxi Applied Physics and Chemistry Research Institute, Xian, CN
- P 48 STUDY ON NICKEL AND DOPAMINE DOUBLE-COATED ULTRAFINE ALUMINUM POWDER AND ITS PROPERTIES**
Liang Li, Chang Zhi-peng, Liao Xin, Guo Xiao-de
Nanjing University of Science and Technology, Nanjing, CN
- P 49 STUDY ON THE PREPARATION OF $\text{Al}/\text{Ni}/\text{PVDF}$ COMPOSITE NANO PARTICLES AND THEIR COMBUSTION PERFORMANCE**
Zhiwei Han
Nanjing University of Science and Technology, Nanjing, CN
- P 50 THERMAL BEHAVIOR OF SOLID MIXTURES OF PHASE STABILIZED AMMONIUM NITRATE (PSAN) AND DIHYDROGLYOXIME**
Ming-Chieh Lin
National Chung-Shan Institute of Science and Technology, Taoyuan, TW
- P 51 TARGETING ENERGETIC AZOLE BASED SALTS VIA COMPUTATIONAL CHEMICAL CALCULATION**
J. Glorian, S. Hagenbach, K.-T. Han, S. Braun, F. Ciszek, B. Baschung
ISL, Saint Louis, FR
- P 52 ENERGY RELEASING MECHANISM OF EXPLOSIVES CONTAINING B/Al UNDER DIFFERENT ENVIRONMENT**
Dayuan Gao, Wei Cao, Qingguan Song, Shanggang Wen, Xiangli Guo
Institute of Chemical Materials CAEP, Mianyang, CN
Feng Zhao, Xinglong Li, Yuanping Zhang
Institute of Fluid Physics CAEP, Mianyang, CN

P 53 DETONATION CHARACTERISTICS OF BORON-CONTAINING EXPLOSIVES ADDED WITH METAL HYDROGEN STORAGE MATERIALS

Wei Cao, Qingguan Song, Dayuan Gao, Xiaojun Lu
Institute of Chemical Materials CAEP, Mianyang, CN
Sen Xu
Nanjing University of Science and Technology, Nanjing, CN

P 54 EXPERIMENTAL STUDY ON CRACK PENETRATION DRIVEN BY BURNING PRODUCTS IN HIGH EXPLOSIVES

Shang Hailin, Yang Jie, Li Tao, Fu Hua, Hu Haibo
Institute of Fluid Physics CAEP, Mianyang, CN

P 55 STUDY ON COMBUSTION CHARACTERISTICS OF GRAPHENE-COATED Al POWDER IN HTPB PROPELLANT

Wu Shi-Xi, Zhou Chong-Yang, Zhang Tian-Fu
Science and Technology on Aerospace Chemical Power Laboratory, Xiangyang, CN
Hu Qi-Wei, Chen Lu-Yang
Hubei Institute of Aerospace Chemotechnology, Xiangyang, CN

P 56 CRITICAL CONTENT OF COMPONENT T27 AFFECTING THE SELF-IGNITION TIME OF NEPE PROPELLANT

Peng Song, Zhao Cheng-Yuan, Cao Rong
Science and Technology on Aerospace Chemical Power Laboratory, Xiangyang, CN

P 57 THE CYCLIC NITRAMINES CRYSTALS CONTAINED METAL MICRO- AND NANOPARTICLES

A. Vorozhtsov, G. Teplov
National Research Tomsk State University, Tomsk, RU

P 58 BALLOTECHNIC RESPONSES OF Al-Ni REACTIVE MATERIAL STRUCTURES RESULTING FROM SHOCK WAVE PROPAGATION

Sang-Hyun Jung, Jin-Sung Lee, Jeong-Kwan Lee, Jung-Su Park
Agency for Defense Development, Daejeon, KR

P 59 INTEGRATION OF THE 3DOM Al/Co₃O₄ NANOTHERMITE FILM WITH A SEMICONDUCTOR BRIDGE TO REALIZE A HIGH-OUTPUT MICRO-ENERGETIC IGNITER

Zilong Zeng, Wenchao Zhang, Chunpei Yu, Jiaxin Wang, Yajie Chen, Jiahai Ye
Nanjing University of Science and Technology, Nanjing, CN

P 60 INNOVATIVE NITROGEN-DOPED BORON PROPELLANTS, PART II

T. Manning, M. Fair, V. Panchal, E. Rozumov
US Army RDECOM ARDEC, Picatinny Arsenal, US
P.H. Matter
Ohio State University, US

- P 61 EFFECT OF WATER ON THE THERMAL DECOMPOSITION MECHANISM OF AMMONIUM DINITRAMIDE (ADN) BY REAXFF REACTIVE MOLECULAR DYNAMICS SIMULATIONS**
Tao Zeng, Rongjie Yang
Beijing Institute of Technology, Beijing, CN
- P 62 ADVANCES IN THE MATERIALS SCIENCE OF NITRAMINES**
R.B. Patel
US Army RDECOM ARDEC, Picatinny Arsenal, US
- P 63 POLY(GLYCIDYL NITRATE) SYNTHESIS AND EXPLOSIVE FORMULATIONS**
E.D. Cooke, A.J. Paraskos, E.R. Beckel, P.E. Anderson
US Army RDECOM ARDEC, Picatinny Arsenal, US
- P 64 SIMULATIONS AND EXPERIMENTAL ON THE INTERFACIAL INTERACTION BETWEEN GAP MATRIX AND FILLERS OF HMX AND FOX-7 IN SOLID PROPELLANTS**
Yu Zhao, Kuanguang Song, Haiyang Wang, Haitao Huang, Hongtao Yang, Yunfei Liu, Wuxi Xie
Xian Modern Chemistry Research Institute, Xian, CN
- P 65 THERMAL DECOMPOSITION KINETICS AND MECHANISM OF DISUBSTITUTED DINITRO METHANES**
L.A. Kruglyakova, R.S. Stepanov
Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, RU
- P 66 APPLICATION OF HIGH PRESSURE GAS-STORAGE GLASS MICROBALLOONS IN EMULSION EXPLOSIVES**
Yixin Wang, Honghao Ma, Zhaowu Shen
University of Science and Technology of China, Hefei, CN
- P 67 COMPUTATIONAL MODELING AND EVALUATION FOR COMPRESSION MOLDABILITY OF INERT EXPLOSIVE POWDER**
Jin Sung Lee
Agency for Defense Development, Daejeon, KR
- P 68 EXPERIMENTAL STUDY ON RESONANCE MIXING OF TATB BASED PBX EXPLOSIVE**
Yanyang Qu, Chunhong Zhan, Jun Wang, Bibo Cheng, Ruijuan Xu, Zhiyong Wei
Institute of Chemical Materials CAEP, Mianyang, CN
- P 69 PREPARATION AND CHARACTERIZATION OF $\text{Cu}(\text{N}_3)_2/\text{rGO}$ COMPOSITE ENERGETIC MATERIALS**
Liu Xu-Wen, Li Ting-Ting, Hu Yan, Ye Ying-Hua, Shen Rui-Qi
Nanjing University of Science and Technology, Nanjing, CN
- P 70 CATALYTIC EFFECT ON COMBUSTION PROPERTIES OF COMPOSITE PROPELLANTS: CuO VERSUS FERROCENE-FUNCTIONALIZED HYDROXYL TERMINATED POLYBUTADIENE**
C. Hortelano, F.L. Tapia, J. Hermida, J.L. de la Fuente
Instituto Nacional de Tecnica Aeroespacial "Esteban Terradas", Madrid, ES

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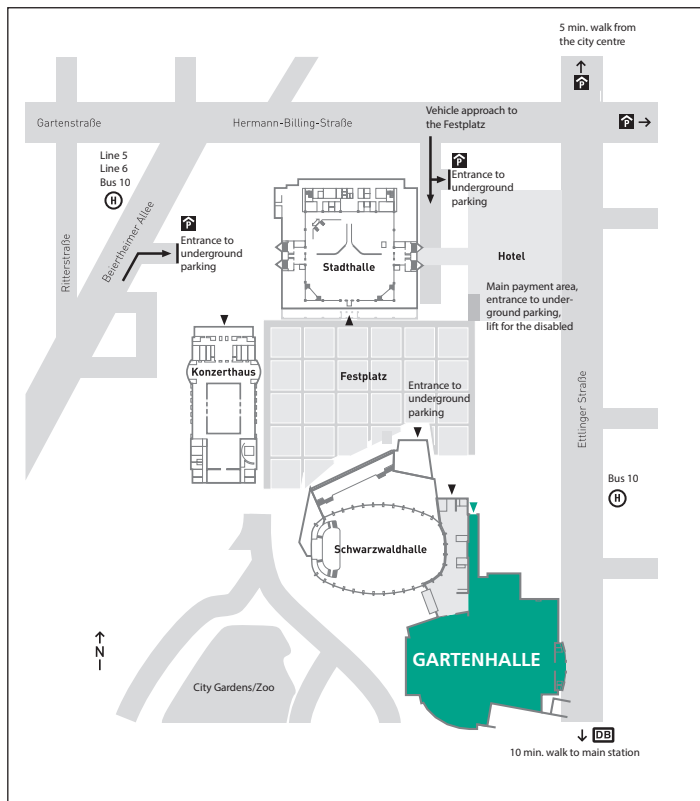
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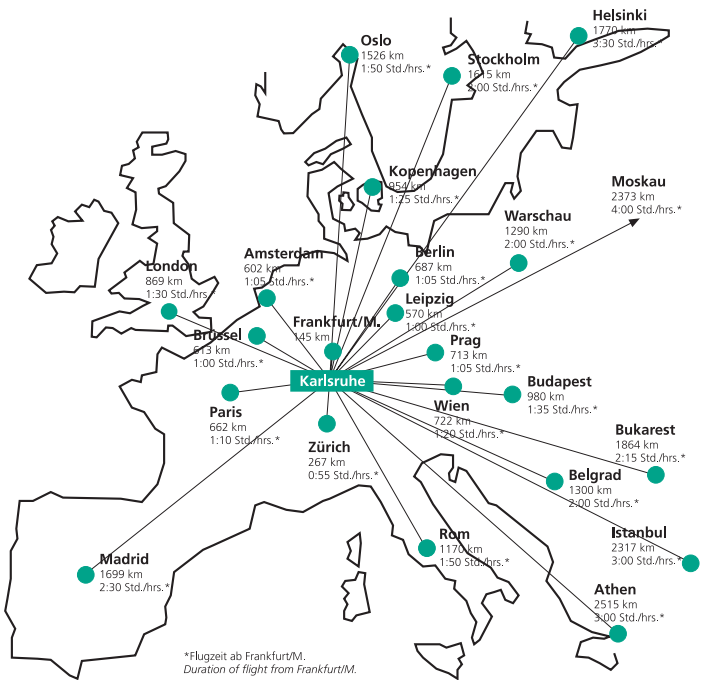
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