

Participants

The seminar is intended for those involved with the procurement, development, production and research of pyrotechnic countermeasures at governmental agencies, research institutes, manufacturers and testing facilities. The seminar is equally suitable for beginners and those already familiar with the topic.

Seminar & Requirements

The seminar is held via CISCO WEBEX®. For details & requirements please check

<https://www.webex.com/video-conferencing>

The total lecturing time is ~ 12 h. This is segmented into 2 x 2 h-sessions per day. The exact broadcasting schedule will be determined upon closure of registration and depends on the individual time zones of all participants.

To attend the seminar requires a computer with internet connection, loudspeaker, camera & microphone.

Seminar fee

The seminar fee is 750.—EUR plus 19 % VAT and includes a printed documentation and online access to the audio-visual recordings of the seminar.

Registration & Cancellation

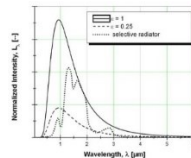
Please register no later than January 25th 2021 per e-mail to Lutradyn – Energetic Materials Science & Technology, Burgherrenstraße 132, D-67661 Kaiserslautern, Germany, E-mail: seminars@lutradyn.com; Tel: ++49(0) 631 3710538

Upon cancellation up to 14 days prior to the seminar a 50 EUR fee will be charged. Cancellations received later effect 25 % charge.

Contents

- **Physical & Chemical Basis**

Discussion of the basic chemistry and physics relating to the design and analysis of pyrotechnic compositions and stores. Introduction to the fundamentals of emission and propagation of radiation.



- **Aerial Infrared Decoy Flares**

Introduction to the “Infrared Threat” to aerial targets and a review of mature and emerging seeker technologies. Discussion of pyrotechnic decoy compositions for advanced, blackbody, spectral, kinematic, area, and propelled flares. Discussion of clandestine pyrotechnic illumination with NIR flares.

Performance Evaluation - II



Combustion of MTV in the Lab



- 1) Aerial Infrared Decoy (AID) - High G
- 2) Aerial Infrared Decoy (AID) - High G
- 3) Aerial Infrared Decoy (AID) - High G

- **Hazards & Safety of Pyrotechnic Countermeasures**

The particular hazards associated with the production and use of pyrotechnic countermeasures are discussed and safety measures for either area are presented. The Insensitive Munitions (IM) characteristics of typical pyrotechnic countermeasure ammunition is discussed.



Online-SEMINAR: „Basic Pyrotechnics”

Infrared Countermeasure Flares & Near Infrared Flares

February 2-4, 2021,
Kaiserslautern

DR. ERNST-CHRISTIAN KOCH, FRSC

Day 1

- Introduction to Energetic Materials
- Thermochemistry
 - i. Heat of Explosion
 - ii. Heat of Combustion
 - iii. Combustion Temperatures
- Design and stoichiometry of pyrotechnic formulations
- Ignition and Propagation
- Emission of Radiation
 - i. UV & Visual
 - ii. Near Infrared
 - iii. Mid Infrared
- NIR Illumination
 - i. State of the Art
 - ii. Next Generation
- Transmission of Radiation
- Absorption
- Scattering

Day 2

- Aerial Targets as Infrared Sources
- Seeker Technology
- Missile Counter-Countermeasures
- Basics of Flare compositions
- Black Body Flare Formulations
- Spectrally Adapted Formulations
 - i. Temperature radiators
 - ii. Selective radiators
- Nose Cones
 - i. High Density flare material
- Propelling Formulations
- Area Formulations
 - i. Red Phosphorus
 - ii. Solid Pyrophorics
- Special Spectral Purpose Decoys

Day 3

- Propelling Formulations
- Area Formulations
 - i. Red Phosphorus
 - ii. Solid Pyrophorics
- Special Spectral Purpose Decoys
- Hazards and Safety of Countermeasures
 - i. Production
 - ii. Testing & Use
 - iii. Health Hazards
 - iv. Insensitive Munitions response of Countermeasures
- Summary

The lecturer



Dr. Ernst-Christian Koch, FRSC studied chemistry at the Technical University of Kaiserslautern (TUK), Germany obtaining his diploma in 1993 and his doctorate in chemistry, in 1995. Following basic military service with the German Armed Forces at Sonthofen (ABC/SeS) and Munster (WIS) Dr. Koch became Head of Development at

the Göllheim Pyrotechnics works (Piepenbrock, Comet) in 1997. From 2002-2004 he worked for Diehl Munitionssysteme and Diehl BGT Defence. In mid-2007 he was appointed Technical Specialist Officer at NATO Munitions Safety Information Analysis Centre (MSIAC) at NATO Headquarters in Brussels and joined NATO in January 2008. Following his departure from NATO in 2013 Dr. Koch held a position as Senior Lecturer in Defence Chemistry at the Defence Academy of the United Kingdom in Shrivenham until 2015. Since 2007 Dr. Koch is a visiting lecturer with the TUK. In 2015 Dr. Koch founded Lutradyn-Energetic Materials.

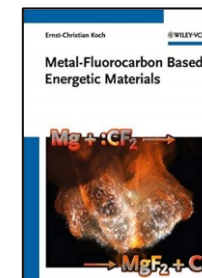
Activities

Dr. Koch is member of the Gesellschaft Deutscher Chemiker (GDCh), German Chapter of the Combustion Institute, International Ballistics Society and [International Pyrotechnics Society](#) (IPS). Dr. Koch co-initiated the [Annual Workshop on Pyrotechnic Combustion Mechanisms](#) in 2004 and continues to co-chair it. In addition he is a member of the Editorial Board of IPS-Journal [Propellant Explosives Pyrotechnics](#) published by Wiley-VCH, a consulting editor with Defence Technology published by Elsevier and serves as a reviewer for the [Strategic Environmental Research and Development Program](#) (SERDP).

Recommended Topical Reading by the Author

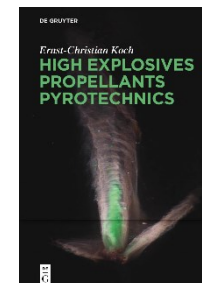
[E.-C. Koch, S. Cuzito, Safer Pyrotechnic Obscurants Based on Phosphorus\(V\)Nitride, *Angew. Chem. Int. Ed.* **2016**, *55*, 15439-15442.](#)

Metal Fluorocarbon Based Energetic Materials
Edition, 2012
XVIII + 342 Pages,
E-Book: ISBN 978-3-11-055965-1



<https://www.amazon.com/-/de/Metal-Fluorocarbon-Based-Energetic-Materials-Ernst-Christian-dp-352732920X/dp/352732920X/>

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