

Hydroxyl radical formation and removal efficiency of sulfonamide antibiotics from real water matrices using UV-LED irradiated TiO₂ and ZnO photocatalysts

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Advanced Oxidation Processes (AOPs) may offer a way to remove several non-biodegradable pollutants released to wastewaters, like antibiotics and other pharmaceuticals [1, 2]. Heterogeneous photocatalysis is a widely researched AOP thanks to its efficient degradation and mineralization of most organic pollutants, but its widespread application is not yet solved. UV-LED light sources can prove to be a highly efficient solution for the excitation of wide bandgap semiconductors like TiO₂ and ZnO [3]. This work aims to compare different UV-LEDs emitting in the UV-A region to fluorescent mercury vapor lamps (MVL) for the excitation of commercial TiO₂ and ZnO photocatalysts. Cheap, commercial LEDs emitting at 398 nm ($P_{\text{electric}}=76$ mW), high power UV-LEDs emitting at 365 nm ($P_{\text{electric}}=2.0$ W), and a MVL emitting in the 300-400 nm range ($P_{\text{electric}}=15.0$ W) has been used.

The photon flux of the light sources and electric efficiency were compared based on iron-oxalate actinometry performed at different electric power input. Coumarin was employed to compare the formation rate of hydroxyl radicals ($\bullet\text{OH}$), and the removal rate and mineralization efficiency of two sulfonamide antibiotics was also investigated. The comparison was based on the removal and mineralization rates, photonic efficiencies, and electric power consumption. For practical application, experiments were also performed in two real water matrices (drinking water, biologically treated wastewater).

In the case of TiO₂, a significantly higher $\bullet\text{OH}$ formation and mineralization rate were determined compared to ZnO. On the other hand, ZnO was slightly more effective at transforming both coumarin and sulfonamide antibiotics. The LEDs emitting at 398 nm were the least efficient during photocatalysis, but the UV-LEDs emitting at 365 nm were more effective and consumed less electric power than the MVL, especially in the case of ZnO. During photocatalytic experiments with the LED light sources, the photonic efficiencies were reduced with increasing the light intensity. In real water matrices, ZnO proved to be significantly more effective than TiO₂, as some components of the matrices even increased the production of $\bullet\text{OH}$.

References

- [1] M.De Liguoro, B.Fioretto, C.Polronieri, G.Gallina, Chemosphere, 75, 1519-1524 (2019)
- [2] M.Biosic, M.Mitrevski, S.Babic, Environ Sci Pollut Res Int, 24, 9802-9812 (2017)
- [3] O.Tokode, R.Prabhu, L.A.Lawton, P.K.J.Robertson, Handb Environ Chem, 35, 159–179 (2015)

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2021

The 2nd International Conference on

UV LED Technologies & Applications

April 19 – 20, 2021



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2nd International Conference on
UV LED Technologies & Applications

Welcome to ICULTA 2021

April 19 - 20, 2021
Virtual event

The inaugural ICULTA conference in 2018 was an outstanding success. With over 260 participants from 23 countries gathered together to educate, discuss, learn, connect and arrange business, specifically centered around UV LED technology and their multiple applications. At the time, we commented that “The great success of ICULTA demonstrates the rapid advancement of UV LEDs, and wide range of solutions the technology has to offer.” Now in a world reeling from the impact of a global pandemic, the need for robust disinfection technologies has become highlighted in a way not imaginable three years ago.

So as we enter this 2021 conference we can be both proud of the progress we have made in developing this technology into life-saving applications, and also excited about the future developments still to be achieved. Of course the application in UV-LED technology is wide ranging and this conference will really highlight the amazing breath of work being completed.

Sessions have been organized along key topics, including “LED Technology”, “Disinfection & Purification”, “Medical Applications”, “SARS-CoV-2”, “Food & Biotech Applications”, “Analytics”, “Measurement Technology”, “UV Curing”, and “Standardization”. The virtual event will feature oral talks, a panel discussion, poster sessions, and an accompanying exhibition.

ICULTA is organized jointly by the German consortium “Advanced UV for Life” (www.advanced-uv.de) and the “International Ultraviolet Association” (IUVA | www.iuva.org). On behalf of everyone involved, the many that have providing organizational support, thank-you for spending your time here with us.

We look forward to the stimulating content and encourage everyone to engage fully in the program and discussion available.

Your conference chairs

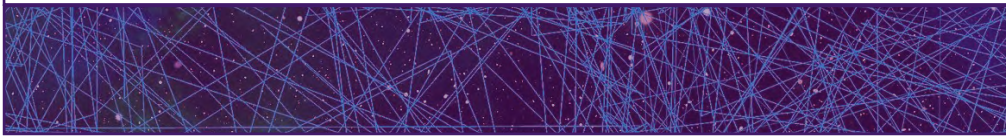
Sven Einfeldt

Ferdinand-Braun-Institute, Germany
Representative of the ‘Advanced UV for Life’
consortium

Oliver Lawal

AquiSense Technologies, USA
Past-President of the International Ultraviolet
Association

Conference Program



Monday, April 19, 2021

Time in CET – Central European Time (UTC +1)

08:15-08:30

Welcome & Opening Remarks

08:30

Exhibition Open

08:30-09:00

Plenary Session [Mo-AB1](#)

UV-LEDs for Water Disinfection: The Forefront of Research and Applications

Kumiko Oguma | *University of Tokyo*

Chair: Tim Wernicke | Technische Universität Berlin

09:00-10:10

Session: Mo-A2 Analytics

Chair: Humberto M. Foronada | OSRAM

09:00-09:20

[| Mo-A2.1 \(Invited\)](#)

Characteristics of UV-LED sources for spectroscopic applications

C. Söller, L. Schäfer, A. Schnabl, O. Deppert, T. Jenek
Heraeus Noblelight GmbH, Germany

09:20-09:40

[| Mo-A2.2 \(Invited\)](#)

Development of LED based diffuse reflectance spectroscopy device for the non-invasive in vivo measurement of UVA-PF and SPF

G. Wiora², C. Throm¹, C. Reble², S. Schanzer¹, S. Kobylinski¹, J. Schleusener¹, H. Karer³, L. Kolbe⁴, I. Gersonde⁵, N. Lobo-Ploch⁶, G. Khazaka², M. Meinke¹, J. Lademann¹
¹Charité - Universitätsmedizin Berlin, ²Courage + Khazaka electronic GmbH, ³Hans Karrer GmbH, ⁴Beiersdorf AG, ⁵University of Potsdam, ⁶Ferdinand-Braun-Institut

09:40-09:55

[| Mo-A2.3](#)

Construction and characterization of a high-power UV-LED module as radiation source for goniometric spectral radiance factor measurements

I. Santourian¹, S. Teichert¹, A. Schirmacher¹, T. Quast¹, K.-O. Hauer¹
¹Physikalisch-Technische Bundesanstalt (PTB)

09:55-10:10

[| Mo-A2.4](#)

DNA analysis with UV LEDs

C. Möller¹, M. Hentschel², M. Weizmann³, Th. Ortlepp¹
¹CiS Forschungsinstitut für Mikrosensorik GmbH, ²Analytik Jena AG, ³OSA Opto Light GmbH

09:00-10:10

Session: Mo-B2 Food & Biotech Applications

Chair: Tim Wernicke | Technische Universität Berlin

09:00-09:20

[| Mo-B2.1 \(Invited\)](#)

Peach flesh metabolome is modulated by UV-B radiation although UV-B does not penetrate the peach skin

A. Ranieri^{1*}, M. Santin¹, A. Castagna¹, M.-T. Hauser², M. B. M. Moreno³, L. Lucini⁴
¹University of Pisa, ²University of Natural Resources and Life Sciences, ³Università Cattolica del Sacro

09:20-09:40

[| Mo-B2.2 \(Invited\)](#)

UV-C LED usage for bacterial decontamination of technical surfaces in food processing

S. Fleischmann¹, S. Opherden¹, P. Rotsch², G. Wiese³, T. Alter¹
¹Freie Universität Berlin, ²OSA Opto Light GmbH, ³SKS Sondermaschinen- und Fördertechnikvertriebs-GmbH

09:40-09:55

[| Mo-B2.3](#)

LED technology for decontamination of dried food ingredients

L. Hinds^{1,2}, C. O'Donnell² Brijesh, K. Tiwari^{1,2}
¹Teagasc Food Research Centre, ²University College Dublin

09:55-10:10

[| Mo-B2.4](#)

Extracts from UVB treated plants do not provoke cytotoxicity, genotoxicity or oxidative stress in vitro

M. Wiesner-Reinhold¹, C. Herz², S. Neugart^{1,3}, S. Baldermann^{1,4}, T. Filler⁵, K. Czajkowski⁵, M. Schreiner¹, E. Lamy²
¹Leibniz Institute of Vegetable and Ornamental Crops e.V., ²University of Freiburg, ³Georg-August-Universität Göttingen, ⁴University of Potsdam, ⁵Ferdinand-Braun-Institut

10:10-11:30

Break

11:30-12:50

**Session: Mo-A3
LED Technology**

Chair: Humberto M. Foronada | OSRAM

11:30-11:50 | [Mo-A3.1 \(Invited\)](#)**Characterization of AlGaIn deep-ultraviolet light-emitting diodes grown on AlN/sapphire templates with dense macro-steps and its application of high-speed solar-blind optical wireless communications**K. Kojima¹, A. Hirano², Y. Nagasawa², Y. Honda³, H. Amano³, Y. Yoshida⁴, M. Shiraiwa⁴, Y. Awaji⁴, A. Kanno⁴, N. Yamamoto⁴, and S. F. Chichibu^{1,3}¹Tohoku University, ²UV craftory Co., Ltd.,³Nagoya University, ⁴National Institute of Information and Communications Technologies (NICT)11:50-12:10 | [Mo-A3.2 \(Invited\)](#)**Understanding the degradation mechanisms of UVB and UVC LEDs to improve their reliability**J. Glaab¹, J. Ruschel¹, J. Rass^{1,2}, H.-K. Cho¹, N. Lobo Ploch^{1,2}, T. Kolbe^{1,2}, A. Knauer¹, S. Walde¹, S. Hagedorn¹, C. Stölmacker¹, K. Hilbrich¹, N. Susilo³, L. Sulmoni³, M. Guttman³, F. Mehnke³, T. Wernicke³, M. Weyers¹, M. Kneissl^{1,3}, S. Einfeldt¹¹Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, ²UVphotonics NT GmbH,³Technische Universität Berlin12:10-12:35 | [Mo-A3.3](#)**Enhanced Light Extraction for UV-LEDs by SMD-Packaging with Integrated Reflectors**U. Hansen¹, S. Maus¹, O. Gyenge¹, X. Hu¹, M. Queisser², S. Marx²¹MSG Lithoglas GmbH²Technical University of Berlin12:35-12:50 | [Mo-A3.4](#)**Fabrication of Aluminum-Coated Plastic Reflectors with an Innovative Metallic Intermediate Layer for High-power UV LED Modules**M. Weizman¹, A. Ruhe¹, S. Cinque¹, P. Rotsch¹, W. Arnold¹, S. Nieland²¹OSA Opto Light GmbH,²GMBU e.V.

11:30-12:50

**Session: Mo-B3
Medical Applications**

Chair: Elliot M. Kreitenberg | Dimer

11:30-11:50 | [Mo-B3.1 \(Invited\)](#)**233 nm UVC LED irradiation for MRSA and MSSA eradication and risk assessment of skin damage ex vivo**M. Meinke¹, P. Zwicker², J. Schleusener¹, S. B. Lohan¹, L. Busch^{1,3}, C. Sicher², A. A. Kühl⁴, C. Keck³, J. Glaab⁵, N. Lobo-Ploch⁵, H. Kyong Cho⁵, T. Filler⁵, S. Hagedorn⁵, L. Wittenbecher⁵, M. Weyers⁵, S. Einfeldt⁵, M. Kneissl⁶, C. Witzel¹, U. Winterwerber⁵, A. Kramer²¹Charité – Universitätsmedizin Berlin,²Universitätsmedizin Greifswald³Universität Marburg, ⁴iPATH.Berlin⁵Ferdinand-Braun-Institut gGmbH, Leibniz-Institut für Höchstfrequenztechnik,⁶Technische Universität11:50-12:10 | [Mo-B3.2 \(Invited\)](#)**Applications of Ultraviolet Light in Healthcare**R. Martinello^{1,2}¹Yale School of Medicine,²Yale New Haven Health12:10-12:35 | [Mo-B3.3](#)**Preventing hospital-acquired infections with UVC LEDs**

M. Ruffin

Excelitas Technologies

12:35-12:50 | [Mo-B3.4](#)**UV-activated prevention of biofilm spreading in siphons**L. Steinhäuser^{1*}, G. Gotzmann¹, F. Fietzke¹, J.-M. Albrecht², U. König¹¹Fraunhofer Institut Organische Elektronik,²MoveoMed GmbH

12:50-14:30

Break

14:30-15:30

Poster Session

15:30-16:00

Plenary Session [Mo-AB4](#)

Thinking outside the treatment plant: UV LEDs for distributed disinfection applications

K. Linden^{*1}, N. Hull² and V. Speight³

¹University of Colorado Boulder

²The Ohio State University

³University of Sheffield

Chair: David Rubin | Healthe

16:00-17:10

Session: Mo-A5

Disinfection & Purification I

Chair: David Rubin | Healthe

16:00-16:20

[| Mo-A5.1 \(Invited\)](#)

Defining a Figure of Merit for UVC Radiation Efficiency in a Water Disinfection Reactor and the Impact of UVT, Reflectivity and Size

L. Schowalter¹, A. Miller¹

¹Crystal IS

16:20-16:40

[| Mo-A5.2](#)

Comparing UV-LED and UV lamps for micropollutant degradation with free chlorine advanced oxidation process in different water matrices

A. Kheyrandish, M. Mohseni

University of British Columbia

16:40-16:55

[| Mo-A5.3](#)

Selection, Evaluation and Integration of UV-LED Water Disinfection Modules

B. Adeli, M. Keshavarzfathy, A. Babaie

Acuva Technologies

16:55-17:10

[| Mo-A5.4](#)

Fundamentals of Design for UV-C LED Surface Disinfection Applications

R.M. Simons, J. Pagan

AquiSense Technologies LLC

16:00-17:10

Session: Mo-B5

SARS-CoV-2

Chair: Elliot M. Kreitenberg | Dimer

16:00-16:20

[| Mo-B5.1 \(Invited\)](#)

Factors affecting UV device validation in air and surface disinfection

C. A. Bernardy, N. M. Elardo, A. M. Trautz,

J. P. Malley

University of New Hampshire

16:20-16:40

[| Mo-B5.2 \(Invited\)](#)

Is far-UVC radiation a promising approach to prevent airborne infections in regard to the ongoing SARS-CoV-2 pandemic?

Axel Kramer und Paula Zwicker

16:40-16:55

[| Mo-B5.3](#)

Disinfection of coronavirus by UVC LEDs: a line of defense to contain pandemics

Hadas Mamane¹, Yoram Gerchman², Nehemya

Friedman^{3,1}, Michal Mandelboim^{3,1}

¹Tel Aviv University, ²University of Haifa and

Oranim College, ³Central Virology Laboratory,

Ministry of Health

16:55-17:10

[| Mo-B5.4](#)

UV Inactivation Kinetics of SARS-CoV-2 and HCoV-229E using UV-LEDs

B. Adeli^{1*}, M. Raeiszadeh¹, M. Keshavarzfathy¹,

E. Espid¹

¹Acuva Technologies

17:10

End of Conference Day & Exhibition

Tuesday, April 20, 2021

Time in CET – Central European Time (UTC +1)

08:30

Exhibition Open

08:30-09:00

Plenary Session [TU-AB1](#)

UV LEDs: Recent advances and future prospects of this versatile technology

N. Lobo Ploch | *UVphotonics NT GmbH*

Chair: Tim Wernicke | Technische Universität Berlin

09:00-10:05

Session: Tu-A2 Disinfection & Purification II

Chair: Marc P. Hoffmann | OSRAM Opto Semiconductors

09:00-09:20 | [Tu-A2.1 \(Invited\)](#)

UV LED system put to the test: a diary of a test center

T. Schwarzenberger, K.-H. Schön, J. Eggers
TZW: DVGW – Technologiezentrum Wasser

09:20-09:35 | [Tu-A2.2](#)

Hydroxyl radical formation and removal efficiency of sulfonamide antibiotics from real water matrices using UV-LED irradiated TiO₂ and ZnO photocatalysts

M. Náfrádi, T. Alapi
University of Szeged

09:35-09:50 | [Tu-A2.3](#)

Enhanced bacterial inactivation through sequential irradiation with UV-LEDs at specific wavelengths

K. Song^{1,2}, F. Taghipour¹, M. Mohseni¹
¹The University of British Columbia, ²Nanjing Forestry University

09:50-10:05 | [Tu-A2.4](#)

UV LED Validation Per USEPA UVDGM and Innovative Approaches

T. Brooks¹, H. Wright¹, M. Heath¹, M. Simpson², O. Autin², A. Renton², T. Schwarzenberger³, K. Schoen³
¹Carollo Engineers, ²Typhon Treatment Systems Ltd., ³TZW: DVGW - Technologiezentrum Wasser

09:00-10:05

Session: Tu-B2 UV Curing

Chair: Tim Wernicke | Technische Universität Berlin

09:00-09:20 | [Tu-B2.1 \(Invited\)](#)

Characteristics of UV-LEDs for Industrial Curing Solutions

P. Burger
Dr. Höhle AG, Gräfelfing

09:20-09:35 | [Tu-B2.2](#)

Continuous nap-core production process including UV-LED curing

M. Köhler¹, C. Dreyer^{1,2}, T. Förster¹, A. Bernaschek^{2,3}, A. Bauer³
¹Fraunhofer-Institute for Applied Polymer Research IAP, ²Technische Hochschule Wildau, ³InnoMat GmbH

09:35-09:50 | [Tu-B2.3](#)

UV-LED-curing – A next-generation technology for textile industry

R. Lungwitz
Sächsisches Textilforschungsinstitut e.V.

09:50-10:05 | [Tu-B2.4](#)

Innovative UV LED Curable Polymer Coatings for Glass Fibers

J. Rosenkranz¹, M. Köhler², Jan. Klein³, C. Dreyer^{2,4}
¹j-fiber GmbH, ²Fraunhofer-Institute for Applied Polymer Research IAP, ³micro resist technology GmbH, ⁴Technische Hochschule Wildau

10:05-11:30

Break

11:30-11:55

Plenary Session [TU-AB3](#)

Exploring the wavelength & efficiency limits of deep UV LEDs

Michael Kneissl^{1,2}

¹Institute of Solid State Physics, Technische Universität Berlin, 10623 Berlin, Germany

²Ferdinand-Braun-Institut gGmbH, Leibniz-Institut für Höchstfrequenztechnik, 12489 Berlin, Germany

Chair: Martin Guttman | Technische Universität Berlin

12:00-13:15

Session: Tu-A4

Measurement Technology

Chair: Martin Guttman | Technische Universität Berlin

12:00-12:15 | [Tu-A4.1](#)

Optical internal quantum efficiency determination of UVC LEDs – towards a standardization of experimental conditions

C. Franker^{1,2}, M. P. Hoffmann¹, F. Nippert²,
H. Wang¹, C. Brandl¹, N. Tillner^{1,3}, H.-J. Lugauer¹,
R. Zeisel¹, A. Hoffmann², M. J. Davies¹

¹OSRAM Opto Semiconductors GmbH,

²Technische Universität Berlin,

³TU Braunschweig

12:15-12:30 | [Tu-A4.2](#)

Accurate UV-C LED measurement techniques include the removal of fluorescence effects

M. Clark, R. Zuber, M. Ribnitzky

Gigahertz-Optik

12:30-12:45 | [Tu-A4.3](#)

Advances in in-situ metrology of UV-LED structures in MOCVD

K. Haberland¹, A. Knauer², M. Weyers²,
J.-T. Zettler¹

¹LayTec AG, ²Ferdinand-Braun-Institut

12:45-13:00 | [Tu-A4.4](#)

UV-LED activated semiconductor biosensor for lactate monitoring in sweat

N. Taleghani, F. Taghipour

The University of British Columbia

13:00-13:15 | [Tu-A4.5](#)

Measurement systems and calibrations for UV radiation

D. Konjhozic, B. Eder, W. Beloglazov

Instrument Systems GmbH

12:00-13:15

Session: Tu-B4

UV Applications

Chair: Marc P. Hoffmann | OSRAM Opto Semiconductors

12:00-12:15 | [Tu-B4.1](#)

UVC-LED based pretreatment for biofouling control in desalination processes with thin-film composite membranes

P. Sperle, C. Wurzbacher, J.E. Drewes,
B. Skibinski

Technical University of Munich

12:15-12:30 | [Tu-B4.2](#)

Impact of irradiation frequencies and duty intervals on UV-LEDs photoreactor performance used in Advanced Oxidation Processes

M.H. Rasoulifard, M. Ganjkanloo,

M.R. Eskandarian

University of Zanjan

12:30-12:45 | [Tu-B4.3](#)

Effect of Wavelength and Intensity on E. coli Inactivation Kinetics

H. Mamane¹, D. Pousty^{1,2}, Y. Gerchman¹,
R. Hofmann²

¹School of Mechanical Engineering,

²University of Toronto

12:45-13:00 | [Tu-B4.4](#)

UV-C LED – challenges, status quo & outlook A perspective from an LED manufacturer

J. Klee

Nichia Chemical Europe GmbH

13:00-13:15 | [Tu-B4.5](#)

UV-C LEDs and their advantages in various system designs

A. Wilm

OSRAM Opto Semiconductors

13:15-15:00

Break

15:00-16:00

Poster Session – Voting for the best poster ends at 15:30.

16:00-16:10

Closing Remarks

16:10-18:15

**Joint Plenary on
Standardization of UV LED (Systems) Characterization Tu-AB5**

Chair: Tim Wernicke | Technische Universität Berlin

16:10 | [AB5.1](#)

UV radiometry for LED-based systems
Peter Sperfeld and Thorsten Gerloff | *PTB, Germany*

16:35 | [AB5.2](#)

**The need for standards in UV-LED water disinfection systems,
and challenges for application to a world market**
Gordon Knight | *International Ultraviolet Association, USA*

16:55 | [AB5.3](#)

**New alternative UV test method in NSF/ANSI 55 –
Ultraviolet microbiological water treatment systems**
Mike Blumenstein | *NSF International, USA*

17:10 | [AB5.4](#)

**UV LED disinfection for public water supply:
Preparation of a test protocol in Germany**
D. Warschke¹, K.-H. Schön², J. Eggers²
¹*Gelsenwasser AG, Willy-Brandt-Allee 26, 45891 Gelsenkirchen, Germany*
²*TZW: DVGW-Technologiezentrum Wasser, Karlsruher Straße 84, 76139 Karlsruhe, Germany*

17:25 | [AB5.5](#)

**Raising the standard: The case for holistic guidelines
for UV-C LED based water treatment systems**
Oliver Lawal | *AquiSense Technologies, USA*

17:40-18:15

Panel Discussion
Standardization: What is needed and what is in the pipeline?

Chair: Ian Mayor Smith | University of Brighton

18:15

End of Conference & Exhibition

Poster Session

Mo-P1

Adsorption of selenate on activated carbon by UV light

S. Aguilar C., J. Alejandro, M. Ortiz G., N. Dasgupta-Schubert
Universidad Michoacana de San Nicolás de Hidalgo

Mo-P2

How the UVC LED industry is organizing to reach high power and new applications

P. Boulay
Yole Développement

Mo-P3

Triggering the release of drugs from nanocarriers in hair follicles by the application of UV-LEDs

L. Busch^{1,4}, Y. Avlasevich², G. Thiede¹, K. Landfester², A. Kramer³, G. Müller³, P. Zwicker³, M. E. Darvin¹,
M. C. Meinke¹, C. M. Keck⁴, J. Lademann¹, A. Patzelt¹
¹Charité – Universitätsmedizin Berlin, ²Max Planck Institute for Polymer Research
³University Medicine Greifswald, ⁴Philipps University Marburg

Mo-P4

Some parameters for technological migration from Hg lamps to LEDs in the UV range for germicidal dose applications

P. Fredes^{1,2*}, U. Raff¹
¹Univ. de Santiago de Chile, ²Hydraluvx Spa

Mo-P5

Electro-optical properties of deep UV LEDs with an emission wavelength near 230 nm

M. Guttman^{1*}, L. Sulmoni¹, N. Lobo-Ploch^{2,3}, F. Mehnke¹, P. Gupta¹, J. Glaab², J. Ruschel²,
H. Kyong Cho², J. Rass^{2,3}, S. Hagedorn², T. Wernicke¹, S. Einfeldt², M. Weyers², M. Kneissl^{1,2}
¹Technische Universität Berlin, ²Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik,
³UVphotonics NT GmbH

Mo-P6

Rapid Integration of LEDs for UVC surface treatment driven by pandemic requirements

Y. Haj-Hmeidi¹
¹LUMITRONIX® LED-Technik GmbH

Mo-P7

UVC LEDs Promise a Giant Leap in Decontamination Efficiency

A. Hedrick, D. Georgeson, Dr. M. Hardwick, Dr. R. Louis
Crystal IS, Cleanbox Technology, Hoag Memorial Hospital

Mo-P8

Integrated digitally adjustable step down converter to control one individual or a series of UV-LED(s)

C. Heinze², M. Frisch¹, Th. Ortlepp^{2*}, O. Brodersen²
¹eesy-ic GmbH, ²CiS Forschungsinstitut für Mikrosensorik GmbH

Mo-P9

Flexible and cost effective UVC LED system design using packageless WICOP LED Technology

M. Hofmann, J.R. Kim, J.H. Jeong
Seoul Viosys Co. LTD. Ansan

Mo-P10

Factors influencing the emission characteristics of UV LED chips - A modular system for customized design

I. K  pplinger^{1*}, D. Mitrenga¹, G. Leibelng², F. Gindele³, Y. Kikuchi⁴, O. Brodersen¹, T. Ortlepp¹

¹CiS Forschungsinstitut f  r Mikrosensorik GmbH, ²JenCAPS Technology GmbH, ³Schott AG, ⁴NGK Insulators, LTD

Mo-P11

Integrated dose simulation tool for UV-LED reactors

M. Keshavarzfathy, B. Adeli, A. Babaie

ACUVA Technologies Inc.

Mo-P12

Emergence of UV-LED as a new technology

S. Kumar, C. Ruckstuhl, H. Maiweg

ACUVA Technologies Inc.

Mo-P13

Stress responds measurements in skin induced by UV-LEDs

S. Lohan¹, D. Ivanov¹, N. Sch  ler², B. Berger², J. Lademann¹, M. Meinke¹

¹Charit   – Universit  tsmedizin Berlin, ²Freiberg Instruments GmbH

Mo-P14

Application of UV LEDs for Tender Coconut Water Processing

M. RaJ Kumar, Y. Sudheer Kuma

CSIR-Central Food Technological Research Institute

Mo-P15

Combination of UV-LED and membrane filtration to treat surface water

A.P. Marques^{1,2}, J. Bernardo², R. Huertas^{1,2}, J.G. Crespo^{1,2}, V.J. Pereira^{1,2}

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Mo-P16

UV-C LED Systems Verse Low Pressure: A Five-Year Cost Comparison

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Mo-P17

Employment of computational tools for optimization of high flow UV-LED water disinfection systems

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A multi-wavelength tunable LED source covering UV-B and UV-A from 280nm to 405nm

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Mo-P19

COVID-19 pandemic: The spark for UVC LED to become a multi-billion dollar business in the next 5 years?

P. Mukish, P. Boulay

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Efficacy of UV-C irradiation emitted by mercury vapor lamp and LED on the bacterial load of eggshells

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Visible blind SiC-based UV spectrometer - Development and characteristics

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A Protocol for Design and Validation of UV-LED Devices for Air and Surface Disinfection

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UV-LED Air Purifier for Degradation of Volatile Organic Compounds in Indoor Air

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Ceramic-based UV-LED photocatalytic membrane reactor development, evaluation, and optimization

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UV LEDs: Improving lifetimes by optimal thermal management

P. Sharma, P. Chen, S. Han, P. Chung, C. Han

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Ultraviolet light decontamination in chicken breast meat

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Aluminium Nitride substrates for epitaxial AlGaIn layers with low dislocation density

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Mo-P28

On the road to direct, optical, on-line germ detection

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Optic concepts for UV LED lamps at long working distances

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Light extraction efficiency enhancement of UVC and UVB LEDs via encapsulation with UV-transparent silicone resins (Deep UV200)

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Disruptive GLED devices and Disinfection Solutions

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