Organisational Information

Sign up at: www.ecpe.org/events

Registration Deadline:

- **27 May 2019**

Participation Fee:

- **€ 595,– * for industry**
- **€ 445,– * for universities/institutes**
- **€ 150,– * for students/PhD students**
  (limited spaces; copy of students ID required; dinner € 50,-* extra)

* plus VAT

- The regular participation fee includes dinner, lunches, coffee/soft drinks and a flash drive with presentations. The reduced (PhD) students fee includes all the above except for dinner (can be booked for an extra fee of € 50,-*)
- A printed version of the workshop handout is available on request (€ 50,-*).
- Upon receipt of registration confirmation via email you are signed-up for the event. The invoice will be sent via letter post.
- Three participants from each ECPE member company free of charge. Allocation in sequence of registration.
- Further information (hotel list and maps) will be provided after registration and can be found on the ECPE web page.
- Cancellation policy: Full amount will be refunded in case of cancellation upon to 2 weeks prior to the event. After this date and in case of no-show 50 % of the fee is non-refundable (replacement is possible).

14-May-19

Organisational Information

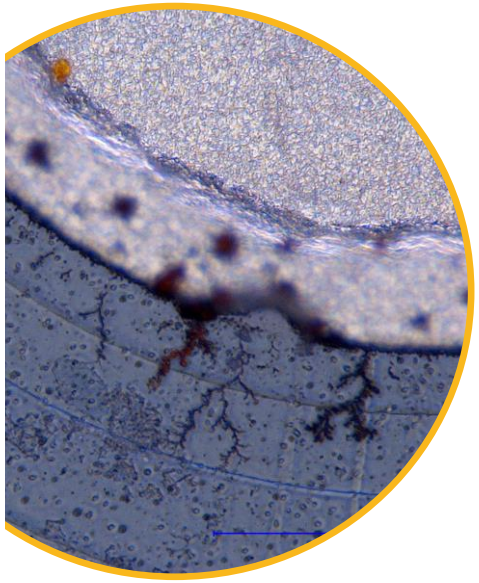
Organiser	ECPE e.V. 90443 Nuremberg, Germany www.ecpe.org
Technical Contact	Dr. Andreja Rojko
Chairmen	Prof. Nando Kaminski, University of Bremen, Germany Michel Piton, Alstom, France
Organisation	Ingrid Bollens, ECPE e.V. +49 (0)911 / 81 02 88 – 10 ingrid.bollens@ecpe.org
Venue	Swissôtel Bremen Hillmannplatz 20 28195 Bremen, Germany

Source: Swissotel

ECPE
European Center for
Power Electronics e.V.

ECPE Workshop

Humidity and Condensation in PE Systems - Degradation Mechanisms and Lifetime Modelling



5 - 6 June 2019
Swissôtel Bremen
Germany

in cooperation with

PINTA ALSTOM Universität Bremen HiPE WiND ECPE

ECPE Workshop

Humidity in Power Electronics - Degradation Mechanisms and Lifetime Modelling

5 – 6 June 2019, Bremen

It is a commonplace that high voltage and humidity do not go together well. Even if the reduced insulation capability does not directly lead to a breakdown, mechanisms like surface discharge, corrosion and ion movement can take place and can eventually lead to a breakdown anyway. Power electronics components, especially IGBT-modules but also others like capacitors, bus bars and circuit boards, are not hermetically sealed. They can take up considerable amounts of moisture and degrade over time.

Of course, the progress of degradation depends a lot on the climatic conditions in the electronics compartment. Usually, it is not air-conditioned and, in some situations, even condensation can occur. With power electronics conquering more and more applications and regions, e.g. offshore wind power, photovoltaic in the tropics or railway in developing countries, the situation is becoming more challenging.

This workshop will give an overview of critical application conditions and will focus on individual humidity issues occurring in the field. In addition, there will be an overview of degradation mechanisms occurring in different components and there will be a compendium of the respective dynamics and their modelling. The workshop will also try to match the component capability with the application needs and vise-versa. What capability is required and what condition has to be avoided by the application?

This way, the workshops brings together the experts of a wide range of fields ranging from applications to material science. Practitioners will get the chance to review the latest scientific results and the scientists will be able to obtain first hand input from the field. Thus, the workshop aims at a better understanding along the value chain. It is also well suited to get an overview, i.e. for professionals from the industry and researchers.

The workshop is chaired by
Prof. Nando Kaminski, University of Bremen (D)
Michel Piton, Alstom (F)

All presentations and discussions will be in English language.

Programme

Wednesday, 5 June, 2019

08:45 **Start of Registration**

09:30 **Welcome and Opening,** N. Kaminski, M. Piton, A. Rojko

Introduction

09:45 **Humidity driven degradation - from Voodoo to a well-understood failure mechanism**
Nando Kaminski, University of Bremen (D)

Semiconductor devices

10:15 **Moisture related degradation mechanisms in power electronic systems**
Patrick McCluskey, University of Maryland / Centre for Advanced Life Cycle Engineering - CALCE (USA)

10:45 Coffee Break

11:15 **The reliability of IGBT modules against humidity and condensation**
Hatori Kenji, Mitsubishi Electric (JP)

11:45 **Dynamics of various humidity driven degradation mechanisms in power semiconductor devices**
Christian Zorn, University of Bremen (D)

12:15 Lunch

13:15 **Humidity robustness – test methods, assessments, improvement and robustness validation**
Sebastian Kremp, Infineon Technologies (D)

Testing and standards

13:45 **Climate test with temperature, humidity and voltage - static or dynamic?**
Peter Nagengast, Stefan Schmitt, Semikron (D)

14:15 **Humidity requirement engineering – standards and real climatic data**
Oliver Schilling, Infineon Technologies (D)

14:45 Coffee Break

Electronics and materials

15:15 **H3TRB on PE - where the humidity attacks!**
Stefan Schmitt, Uwe Scheuermann, Semikron (D)

15:45 **Interplay of humidity and electrical functionality imposing reliability problems in electronics**
Rajan Ambat, Technical University of Denmark (DK)

16:15 **New quality test for susceptibility of encapsulated electronics to harmful gas corrosion**
Markus R. Meier, Helmut Schweigart, Zestron (D)

16:45 **Influence of humid.&temp. in electrical fields on the material properties of insulating housing materials**
Sandy Klengel, Bianca Böttge, Fraunhofer IMWS (D)

17:30 Optional Programme: City tour guided by hosts

19:00 Dinner at “Himmelsaal”, Radisson Blue Hotel, Bremen

Programme

Thursday, 6 June, 2019

Passives

08:30 **Influence of housing conditions to physical and electrical properties of metallized film capacitors in a 85°C/85% Rh-Test**
Thomas Ebel, University of Southern Denmark (DK)

09:00 **Studies on metal spray metallization as humidity barrier in film capacitors**
Azahara Albéndiz, TDK Electronics Components (ES)

09:30 **Inductive components in humid and dirty environment**
Marek Siatkowski, BLOCK Transformatoren-Elektronik (D)

10:00 Coffee Break

Introduction applications

10:30 **Humidity robust power electronics converters: challenges for the designer**
Michel Piton, Alstom (FR)

11:00 **Unexpected/expected issues with humidity in automotive**
Jean Michel Morelle, Valeo (FR)

11:30 **ECPE Working Group Power Semiconductor Reliability for Railway Application**
Andreja Rojko, ECPE (D)

Applications: Rolling Stock

11:45 **Semiconductor reliability of worldwide operated traction converter**
Bernd Laska, Siemens (D)

12:15 Lunch

13:15 **Environmental conditions of semiconductor devices in railway application and their challenges**
Roland Schmid, Bombardier (CH)

13:45 **Environmental condition measurement in a real railway application**
Uxue Larranaga, CAF Power & Automation (ES)

14:15 **An on-going history of power electronics usage in SNCF traction application; impact of its reliability on railway service availability**
Khalil Dahraoui, Pascal Mannevy, SNCF (FR)

14:45 Coffee Break

Applications: Wind power

15:00 **Humidity in power converters of wind turbines - field conditions and impact on reliability**
Katharina Fischer, Fraunhofer IWES (D)

15:30 **Experiences from converter monitoring in a wind turbine field application**
Bjørn Rannestad, KK Wind Solutions (DK)

16:00 End of Workshop