

## Organisational Information

Sign up at: [www.ecpe.org/events](http://www.ecpe.org/events)

Registration Deadline:

**9 September 2024**

Participation Fee:

- € 600,- \* for industry
- € 470,- \* for universities/institutes
- € 160,- \* for students/PhD student  
(limited spaces; copy of students ID required)

\* plus VAT

- The participation includes dinner, lunches, coffee/soft drinks and digital proceedings. The reduced (PhD) students fee includes all except for dinner (can be booked for an extra fee of € 50,-\*)
- Digital proceedings will be provided by download link latest one day before start of the event. A printed 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 email.
- 25 % discount for participants from ECPE member companies.
- 10% discount on university/institute fee for participants from ECPE competence centres.
- 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 50 % of the fee is non-refundable (replacement is possible).
- The number of participants is limited to 35 attendees.

17/04/24

## Organisational Information

**Organiser** ECPE e.V.  
Ostendstrasse 181  
90482 Nuremberg, Germany  
[www.ecpe.org](http://www.ecpe.org)

**Technical Chair** Prof. Dr.-Ing. Albert Claudi  
University of Kassel

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**Organisation** Ingrid Bollens, ECPE e.V.  
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**Venue** NH Hotel Las Artes  
Av. de l'Institut Obrer de València, 28,  
Quatre Carreres,  
46013 València, Valencia, Spain



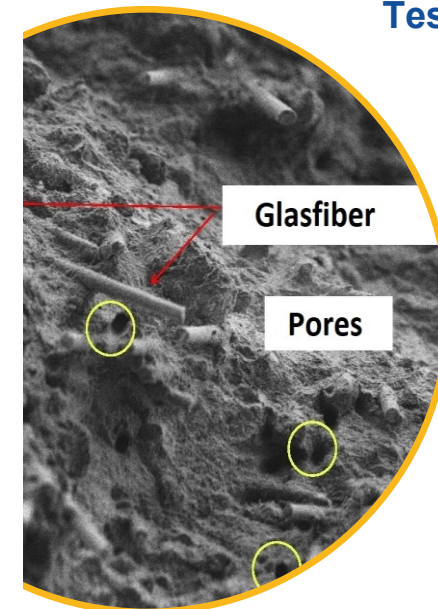
Source photo: NH Hotel Valencia Las Artes  
Source graph front page: Fraunhofer IMWS



European Center for  
Power Electronics e.V.

## ECPE Tutorial

### Insulation Polymers for Power Electronics: Failure Mechanisms, Preventive Measures, Testing Strategies



17 - 18 September 2024  
Valencia, Spain

## ECPE Tutorial

### Insulation Polymers for Power Electronics: Failure Mechanisms, Preventive Measures, Testing Strategies

17 – 18 September 2024  
Valencia, Spain

The intention of this tutorial is to teach the basics of failure mechanisms of insulating materials in power electronics.

Decreasing size and high operating voltages result in a high stress level for the electrical insulating system of power electronics. Thus, it becomes more important to use highly effective and reliable insulating materials. For the design of the insulation materials an extensive knowledge of the different failure and erosion mechanisms is necessary.

Power electronics, used in outdoor areas, are exposed to environmental conditions. Extended temperature range, humidity and pollution are stressing the insulation characteristics of the materials. Thus, another topic is the influence of environmental conditions on the failure mechanisms of the insulating material.

The participants will understand the different breakdown and aging mechanisms as well as the different possibilities to protect against these failures. Moreover, the testing procedures for materials and the evaluation of life-time curves, based on experimental and statistical methods are presented.

#### The tutorial is co-chaired by:

Prof. Dr. Albert Claudi, University of Kassel  
Dr. Sebastian Wels, CRW Engineering  
Dr. Markus Meier, Zestron Europe  
Tobias Raulf, CRW Engineering  
Marco Rudolph, Fraunhofer IMWS

All presentations and discussions will be in English.

## Programme

### Tuesday, 17 September 2024

09:00 Registration & Welcome Coffee

09:30 Welcome, Opening  
Peter Rechberger, ECPE e.V.  
Albert Claudi, University of Kassel

09:45 Introduction and Motivation  
Albert Claudi

10:00 Failure Mechanisms – Basics  
Albert Claudi  
- Insulation Requirements  
- Breakdown Mechanisms  
- Statistical Evaluation  
- Partial Discharge, Space Charges, Erosion

11:00 Coffee Break

11:30 Failure Mechanisms – Basics (continuation)  
Albert Claudi

12:30 Physics of Electrical Degradation  
Sebastian Wels

13:00 Lunch

14:00 Moisture and Material-Induced Failure Mechanisms  
Markus Meier  
- Electrochemical Migration (ECM)  
- Conductive Anodic Filament (CAF)  
- Anodic Migration Phenomenon (AMP)

15:00 Preventive and Counter Measures Against Migration Phenomena  
Markus Meier  
- Strategies for corrosion protection  
- Requirements for coatings, pottings and mold compounds

15:30 Coffee Break

16:00 Testing Methods  
Sebastian Wels

17:30 End of Day 1

20:00 Dinner

## Programme

### Wednesday, 18 September 2024

09:00 Start of 2nd Day

09:00 Quality and Reliability Testing  
Markus Meier  
- (HAST) Quality tests for insulation materials  
- Reliability testing according to AQG324

10:00 Detection and Localization of Partial Discharges  
Tobias Raulf

11:00 Coffee Break

11:30 Microstructure Diagnostics on Insulation Polymers  
Marco Rudolph  
- Characteristic Methods  
- Microstructural Analyses- Numerical Approaches for Permeation

12:30 Final Discussion, Feedback

13:00 Lunch

14:00 End of Tutorial