

**26<sup>th</sup> Nordic Insulation Symposium on Materials, Components and Diagnostics**  
**12. – 14. June 2019 at Tampere, Finland.**

For papers presented at oral sessions, the maximum time allocated for each presentation is 15 minutes + discussion.

## **Program**

### **Wednesday, June 12, 2019**

**08:00-09:00 Registration at Museum Centre Vapriikki**

**09:00-09:10 Symposium opening** by the Chairman Kari Lahti

**09:10-10:00 Invited Lecture: Nanofibrous piezoelectric structures for composite materials to be used in electrical and electronic components**  
given by Associate Professor Davide Fabiani, *University of Bologna*

**10:00-10:20 Coffee break**

**10:20-11:40 Session 1 – Partial discharges**

Chairman: Peter Wouters, Eindhoven University of Technology (NL)

**Precision Calibration System for Partial Discharge Calibrators**  
Jussi Havunen, Jari Hällström  
*VTT MIKES, Finland*

**Limitations Regarding Use of the ABC-Model for Interpretation of Partial Discharge Measurements**

Torstein Grav Aakre, Regina Skattenborg, Erling Ildstad  
*NTNU / Department of Electrical Power Engineering, Trondheim, Norway*

**Application of Machine Learning for Partial Discharge Classification under DC Voltage**

Bernhard Schober, Uwe Schichler  
*Graz University of Technology, Austria*

**Identification and Location of Partial Discharge Defects in Medium Voltage Cables**

Muhammad Shafiq<sup>1</sup>, Guillermo Robles<sup>2</sup>, Amjad Hussain<sup>3</sup>, Kimmo Kauhaniemi<sup>1</sup>, Matti Lehtonen<sup>4</sup>

<sup>1</sup>*University of Vaasa, Finland;* <sup>2</sup>*Universidad Carlos III de Madrid, Spain;*

<sup>3</sup>*American University of Kuwait, Kuwait;* <sup>4</sup>*Aalto University, Finland*

**11:40-13:00 Lunch**

## 13:00-14:15 Session 2 – Materials 1

Chairman: Erling Ildstad, NTNU (Norway)

### **Characterization of Silicone Oil used in HV Cable Sealing Ends**

Suvi Tiia Hannele Virtanen<sup>1</sup>, George Callender<sup>1</sup>, Thomas Andritsch<sup>1</sup>, James Pilgrim<sup>1</sup>, David Wheatley<sup>2</sup>, Richard C Brown<sup>2</sup>, Graham J Langley<sup>2</sup>, Oliver Cwikowski<sup>3</sup>

<sup>1</sup>*Electronics & Computer Science, University of Southampton, United Kingdom*

<sup>2</sup>*Department of Chemistry, University of Southampton, Southampton, United Kingdom*

<sup>3</sup>*National Grid Electricity Transmission, United Kingdom*

### **Surface Modification of Fumed Silica by Dry Silanization for PP/POE-based Dielectric Nanocomposites**

Xiaozhen He<sup>1</sup>, Ilkka Rytöluoto<sup>2,3</sup>, Amirhossein Mahtabani<sup>1</sup>, Rafal Anyszka<sup>1</sup>, Eetta Saarimäki<sup>2</sup>, Kari Lahti<sup>3</sup>, Mika Paajanen<sup>2</sup>, Wilma Dierkes<sup>1</sup>, Anke Blume<sup>1</sup>

<sup>1</sup>*University of Twente, Faculty of Engineering Technology, Department of Mechanics of Solids, Surfaces & Systems (MS3), Chair of Elastomer Technology and Engineering, Enschede, The Netherlands;*

<sup>2</sup>*VTT Technical Research Centre of Finland Ltd, Tampere, Finland;*

<sup>3</sup>*Tampere University, High Voltage Engineering, Tampere, Finland*

### **Influence of degree of crystallinity on DC-conduction of polypropylene**

Sari Johanna Laihonen, Helena Greijer

*ABB Corporate Research, Sweden*

### **Electrical detection of degradation in specimens of HVDC cable insulation**

Douglas Jutsell Nilsson, Stanislaw Gubanski

*Chalmers, Sweden*

## 14:15-14:35 Coffee break

## 14:35-15:50 Session 3 – Charging, conduction and breakdown

Chairman: Ilkka Rytöluoto, VTT Technical Research Centre of Finland (Finland)

### **Influence of Field Grading in Setup for Electric Breakdown Testing of Polyethylene Films**

Johan Andersson, Ulf Nilsson, Susanne Nilsson, Nilena Nilsson, Hedvig Pollak  
*Borealis, Sweden*

### **Development and Optimization of a Pulsed Electroacoustic System with Temperature Controlled Electrodes**

Rashid Hussain, Volker Hinrichsen

*Technische Universität Darmstadt, High-Voltage Laboratories, Germany*

### **Time-Dependent Electric Field Distribution in Layered Paper-Oil Insulation**

Gunnar Håkonseth<sup>1,2</sup>, Erling Ildstad<sup>2</sup>

<sup>1</sup>*Nexans Norway AS, Norway;* <sup>2</sup>*Norwegian University of Science and Technology*

**Practical Notes on the Measurement and Interpretation of Thermally Stimulated Discharge Currents in Biaxially Oriented Polypropylene**

Ilkka Rytöluoto<sup>1,2</sup>, Minna Niittymäki<sup>2</sup>, Kari Lahti<sup>2</sup>

<sup>1</sup>VTT Technical Research Centre of Finland; <sup>2</sup>Tampere University, Finland

**19:00-23:30 Symposium banquet at Viikinsaari Island**

**Thursday, June 13, 2019**

**09:00-10:15 Session 4 – Testing, condition monitoring and assessment**

Chairman: Henrik Hillborg, ABB (SE)

**Application of Open-air Capacitive Sensors for Voltage Monitoring near Terminations in HV and EHV Insulated Connections**

Peter Wouters<sup>1</sup>, Fani Barakou<sup>1</sup>, Fred Steennis<sup>1,2</sup>

<sup>1</sup>Eindhoven University of Technology, Eindhoven, The Netherlands; <sup>2</sup>DNV GL, Arnhem, The Netherlands

**Influence of Standard Lightning Impulse Front Time Tolerances on the Flashover Voltage of Suspension Insulators**

Joni Kluss, Mojtaba Chalaki Rostaghi, Kamran Yousefpour, Zeeshan Ahmed, Farhina Haque

*Mississippi State University, United States of America*

**Performance of UV and IR Sensors for Inspections of Power Equipment**

Gernot Komar<sup>1</sup>, Oliver Pischler<sup>1</sup>, Uwe Schichler<sup>1</sup>, Radu-Laurentiu Vieriu<sup>2</sup>

<sup>1</sup>Institute of High Voltage Engineering and System Performance, Graz University of Technology, Graz, Austria; <sup>2</sup>SIEMENS AG Österreich, Corporate Technology, Active Vision Technologies, Graz, Austria

**An Electrode Setup for Non-contact Dielectric Response Measurement**

Jing Hao<sup>1</sup>, Xiangdong Xu<sup>2</sup>, Nathaniel Taylor<sup>1</sup>

<sup>1</sup>KTH Royal Institute of Technology, Sweden; <sup>2</sup>Chalmers University of Technology, Sweden

**10:15-10:35 Coffee break**

**10:35-11:50 Session 5 – Cables and accessories**

Chairman: Frank Mauseh, NTNU (Norway)

**Surface Hydrophobicity in Medium Voltage Terminations**

Kenneth Kimmo Miika Väkeväinen

*Ensto Finland Oy, Finland*

**Review of CIGRE TB 496 regarding Prequalification Test on Extruded MVDC Cables**

Anton Buchner, Uwe Schichler

*Graz University of Technology, Austria*

**Cable Capacity Enhancement by Utilizing Trapezoidal Voltage Waveform**

Mohamad Ghaffarian Niasar<sup>1</sup>, Wanlin Li<sup>1</sup>, Peter Vaessen<sup>1,2</sup>

<sup>1</sup>*Technical University of Delft, The Netherlands, Netherlands, The;* <sup>2</sup>*DNVGL, KEMA Laboratories, The Netherlands*

**Blister Test as Method of Measuring Adhesion of Solids on a Flat Surface**

Knut Brede Liland<sup>1</sup>, Hallvard Faremo<sup>1</sup>, Knut Magne Furuheim<sup>2</sup>

<sup>1</sup>*SINTEF Energi, Norway;* <sup>2</sup>*Nexans Norway*

**11:50-13:00 Lunch**

**13:00-14:15 Session 6 – Materials 2**

Chairman: Jari Kotiniitty, GE Grid Solutions (FI)

**Silicone Gel Compounds for Non-Linear Stress Grading Applications**

Sebastian Wels<sup>1</sup>, Johann Bauer<sup>2</sup>, Jens Lambrecht<sup>3</sup>, Albert Claudi<sup>1</sup>

<sup>1</sup>*University of Kassel, Germany;* <sup>2</sup>*Merck KGaA, Darmstadt, Germany;* <sup>3</sup>*Wacker Chemie AG, München, Germany*

**Effective surface functionalization of fumed silica with NBR telechelic oligomer for high-voltage polyolefin-based dielectric composites**

Rafal Anyszka, Xiaozhen He, Amirhossein Mahtabani, Wilma Dierkes, Anke Blume  
*Department of Mechanics of Solids, Surfaces and Systems (MS3), Faculty of Engineering Technology, Chair of Elastomer Technology and Engineering, University of Twente, Enschede, The Netherlands*

**Silica-Polypropylene Nanocomposites for Film Capacitors: Structure–Property Studies and the Role of Biaxial Stretching Conditions**

Ilkka Rytöluoto<sup>1,2</sup>, Minna Niittymäki<sup>2</sup>, Kari Lahti<sup>2</sup>, Eetta Saarimäki<sup>1</sup>, Timo Flyktman<sup>1</sup>, Mika Paajanen<sup>1</sup>, Mikko Karttunen<sup>1</sup>

<sup>1</sup>*VTT Technical Research Centre of Finland (VTT), Tampere, Finland;* <sup>2</sup>*Tampere University (TAU), Electrical Engineering, Tampere, Finland*

**Solution Modified Fumed Silica and Its Effect on Charge Trapping Behavior of PP/POE/Silica Nanodielectrics**

Amirhossein Mahtabani<sup>1</sup>, Ilkka Rytöluoto<sup>2,3</sup>, Xiaozhen He<sup>1</sup>, Eetta Saarimäki<sup>3</sup>, Kari Lahti<sup>2</sup>, Mika Paajanen<sup>3</sup>, Rafal Anyszka<sup>1</sup>, Wilma Dierkes<sup>1</sup>, Anke Blume<sup>1</sup>

<sup>1</sup>*University of Twente, Faculty of Engineering Technology, Department of Mechanics of Solids, Surfaces & Systems (MS3), Chair of Elastomer Technology and Engineering, Enschede, The Netherlands;* <sup>2</sup>*Tampere University, High Voltage Engineering, Tampere, Finland;* <sup>3</sup>*VTT Technical Research Centre of Finland Ltd, Tampere, Finland*

**14:15-14:35 Coffee break**

**14:35-15:35 Session 7 – Rotating machines**

Chairman: Hans Edin, KTH (Sweden)

**Comparison of Low and High Frequency Partial Discharge Measurements on Stator Windings**

Howard Sedding, Greg Stone  
Qualitrol - Iris Power, Canada

**Time Development of Voltage Frequency Dependence of Partial Discharge Activity in Voids**

Torstein Grav Aakre<sup>1</sup>, Erling Ildstad<sup>1</sup>, Sverre Hvidsten<sup>2</sup>

<sup>1</sup>*INTNU/ Department of Electrical Power Engineering, Trondheim, Norway;* <sup>2</sup>*SINTEF Energy Research, Trondheim, Norway*

**Temperature Influence on Dielectric Response of Rotating Machine Insulation and Its Correction**

Jialu Cheng<sup>1</sup>, Nathaniel Taylor<sup>1</sup>, Peter Werelius<sup>2</sup>

<sup>1</sup>*KTH, Sweden;* <sup>2</sup>*Megger, Sweden*

**15:35-15:50 Closing of the Symposium**

**Friday, June 14, 2019**

**07:45-14:00 Technical Excursion, Ensto Oy, Porvoo**