## Paris Session 2022



## Laboratory Characterization of Material Interfaces Present in HVDC Joints Study Committee D1 Preferential Subject 2: Materials for Electrotechnical Purposes Question 2.06 (Interfaces in HVDC) "How do we close the gap between small scale laboratory samples and joints installed...?" Timothy Person (United States)

Group Discussion Meeting

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## Material Interfaces and Impact System Reliability

- CIGRE TB 210 (2002) Interfaces in Accessories for HV and EHV cables
  - Influential factors include
    - o Interfacial roughness
    - o Contact pressure
    - o Lubricant

- o E-Field Distribution
- o Temperature and changes
- o Quality of installation
- Plus... "Long-term" performance aspects
  o e.g. Material relaxation, lubricant migration
- Yet, lab material characterizations typically <u>do not</u> include several of these aspects...

and rely upon modeling/full-scale evaluations to predict/validate system performance.

Opportunity exists for an improved laboratory evaluation of the material system...

which can account for as many of these influential factors as possible

**Group Discussion Meeting** 

## An example of a laboratory apparatus for interfacial studies

- Specimens include interface of cable and accessory insulating materials, semiconductive electrodes, and optional lubricant/grease
  - Controlled variables:
    - o Interfacial roughness, interfacial pressure
    - o Temperature and Time (Aging)
    - o Applied voltage, electrode spacing
  - Measure interfacial breakdown voltage
    - o Can be augmented with modeling
- Benefits
  - Probes aspects of the "imperfect" interface
  - Potential for design of more robust material systems.

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Need for more studies/data from industry on impact of interfaces on system reliability.



Acknowledgment of our design team: A. Shah, W. Xu, Y. Rao



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