

# Paris Session 2022



Are alternative methods to measure ageing  
mirroring the functional properties?

SC D1

PS1 / Q 1.13

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## Question and our contribution

### Question 1.13

Which functions are influenced by ageing of liquid insulation systems?

What are the possibilities to verify these functions?

Are alternative methods to measure ageing mirroring the functional properties?

### Answer

- ✓ Influenced functions are insulation performance, and so on
- ✓ Functional testing, Dismantling investigation, and Nondestructive diagnosis are effective to verify
- ✓ Some conventional measurement methods are not ideal in some cases

#### **In the case of a power transformer,**

- The common estimation methods of DP of insulating paper are indirect methods. The amount of decomposition products (CO<sub>2</sub>, CO, Furfural) from the insulating paper that dissolve in insulating oil is measured.
- In the evaluation methods of static electrification, the effect of degradation of the insulating paper is not considered.

## OUR PROPOSAL

**Diagnostic method using cellulose fibers** suspended in the insulating oil.

- Cellulose fibers peeled off from the surface of insulating paper and press board -

### (1) To estimate the DP of insulating paper

- The degree of degradation of cellulose fiber can be estimated by measuring RI.

Degraded cellulose fibers become high crystalline.

Highly crystallized cellulose fibers have a highly refractive index (RI).

### (2) To evaluate the static electrification

- Using cellulose fibers and oil in the actual transformer as a sample, the effect of degradation of insulating paper on static electrification can be evaluated.

Conventional measurement methods use a new cellulose as a sample of solid insulation material, i.e., it evaluates characteristics of insulating oil only.