Paris Session 2022

# Superior Size Reduction Insulating Spacer for 245kV class GIS by FGM and Nanocomposite Material Technology.

## SC D1 Materials and emerging test techniques
## PS2/Q_2.09

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## 1. Question and our contribution

< Question>

Q PS2.09: Is the reduction in the number of contributions on nanocomposites a sign of waning interest, acceptance that bulk processing remains a significant challenge or a reflection that these materials are moving towards real-world deployment? How close is the industry to deployment of nanocomposites?

< Answer >

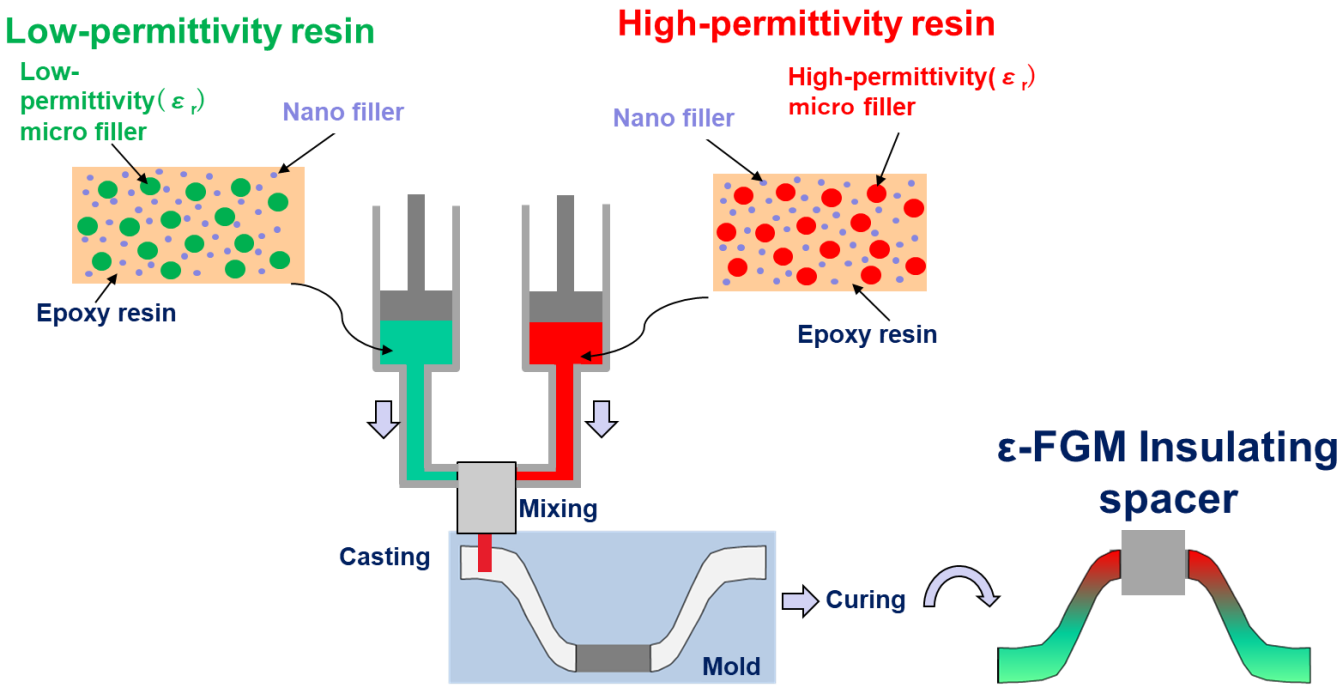
・The insulating spacers with a 30% smaller diameter for 245kV class GIS has been developed using the permittivity (ε) functionally graded materials (ε-FGM) and a nanocomposite materials. The application of these technology is highly effective for downsizing of GIS and GIL.

・Furthermore, when using an alternative gas such as dry air, which has lower insulation than $SF_6$, the application of FGM and nanocomposite material technology to GIS and GIL can suppress the increase of equipment size and gas pressure.

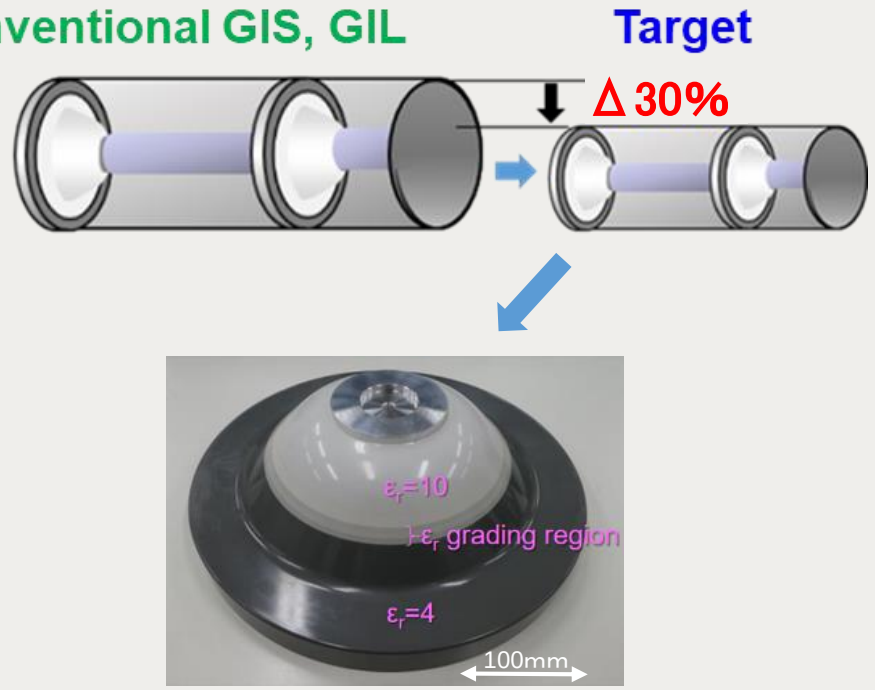
# 2. Introduction

R & D has been conducted to downsize insulating spacers with a 30% smaller diameter using the latest functional insulating materials such as permittivity (ε) functionally graded materials (ε-FGM) and a nanocomposite materials.

## Concept of flexible mixture casting method for insulating spacer




## Target of studies

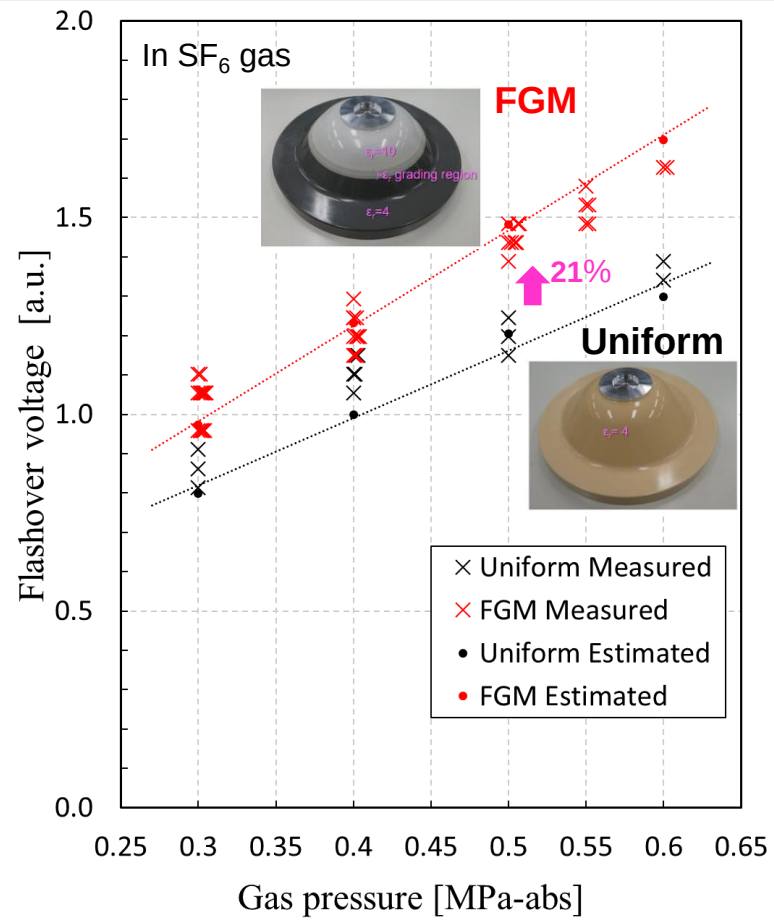



**Produced actual size 245kV class GIS insulating spacer with LIWV ±1050kV**

# 3. Details of the study

・LI voltage FOV: improved by 21%

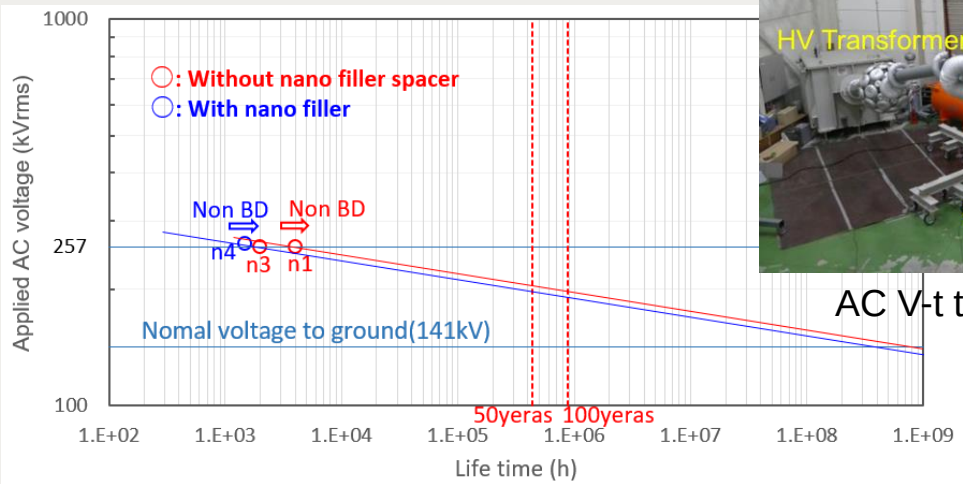
・15 times LI ±1050 kV satisfied




Test results of LI flashover voltage for uniform and ε-FGM spacer models.

・Long term AC V-t: ≧100yeas

Applied V=AC257kVrms

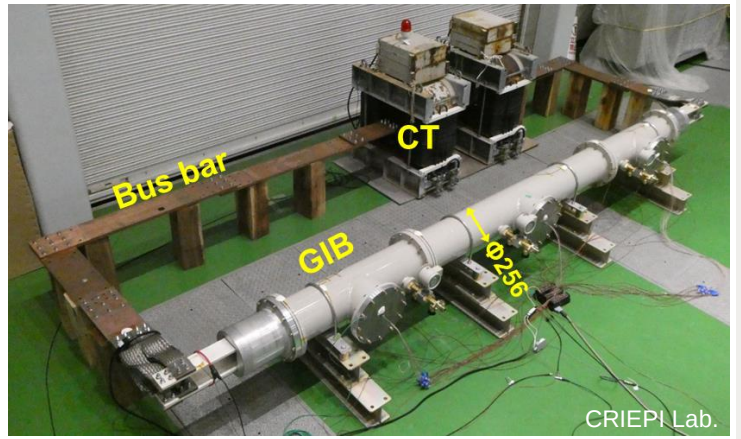



Long term AC V-t test for 245kV GIS spacer


AC V-t test apparatus

・Temperature rise: < 75K

Rated I=4000A




Temperature rise test of GIB

# 4. Conclusion

・The insulating spacers with a 30% smaller diameter for 245kV class GIS has been developed using the permittivity (ε) functionally graded materials (ε-FGM) and a nanocomposite materials. The application of the technology is highly effective for downsizing of GIS and GIL.

・Furthermore, when using an alternative gas such as dry air, which has lower insulation than $SF_6$, the application of FGM and nanocomposite material technology to GIS and GIL can suppress the increase of equipment size and gas pressure.

Thank you for your attention !