

Partial Discharges in Gas-Insulated Systems with Alternative Insulating Gases

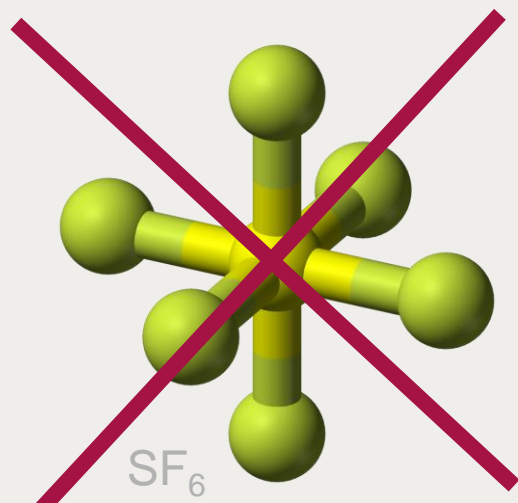
SC D1: Materials and Emerging Test Techniques

PS 2: Materials for Electrotechnical Purpose

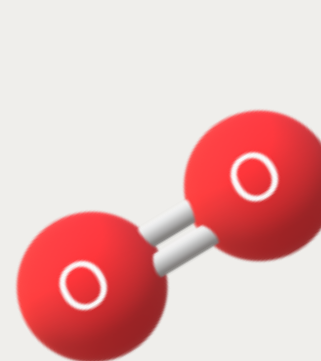
Question 2.01: What are open technical questions concerning the application of SF₆ gas alternatives? How can CIGRE support?

Thomas Götz, Germany

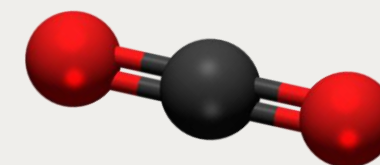
Open Technical Questions Concerning The Application of SF₆ Gas Alternatives



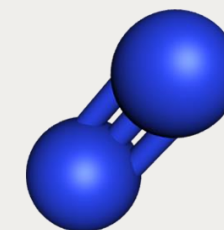
Pure gas with high global
warming potential



Oxygen



Carbon Dioxide



Nitrogen

Various gas mixtures with low global
warming potential at high gas pressures

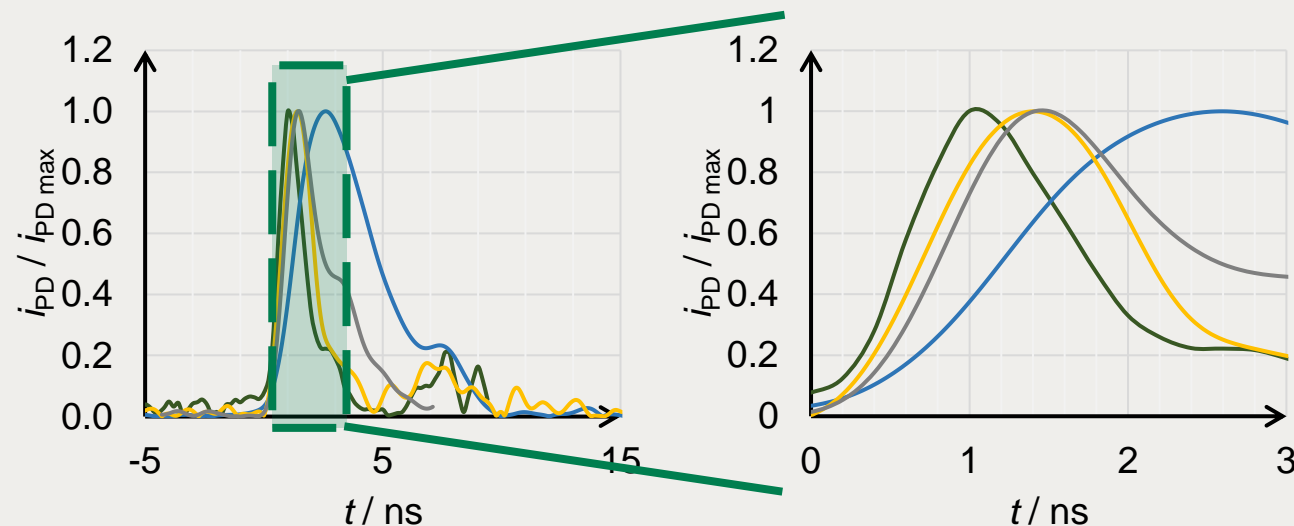
Images: Wikimedia, AirLiquide, Dilo

Should there be no influence on the PD behaviour?

Open Technical Questions Concerning The Application of SF₆ Gas Alternatives

Measured PD current amplitude for different gases and gas mixtures

— SF₆ (0.5 MPa only) — CO₂ / O₂ / C4-FN mixture (3.5 % C4-FN in CO₂ / O₂)
— CO₂ — Synthetic Air



Experimental parameter: 0.7 MPa_{abs}, 5 mm protrusion, AC or DC voltage stress

- Different rise times of the PD current
- Varying spectrum in the UHF range
- Different charge generated
- Influence on subsequent PD events?

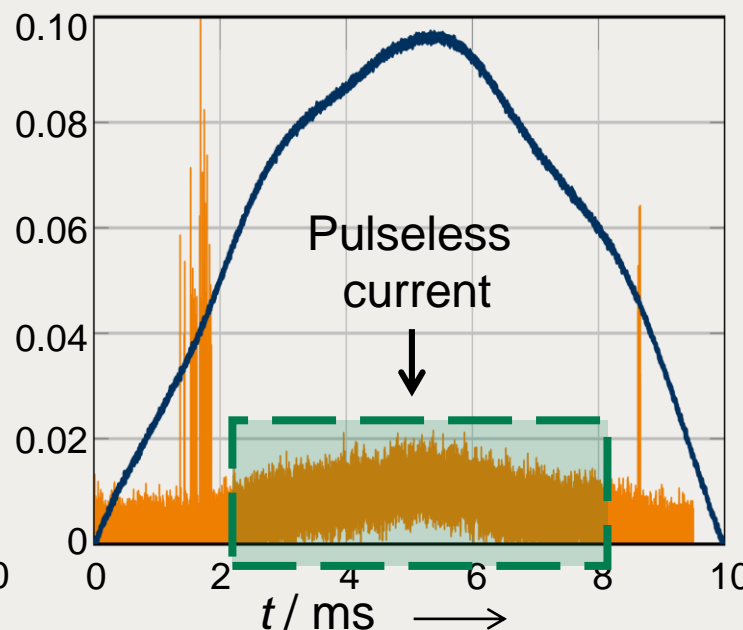
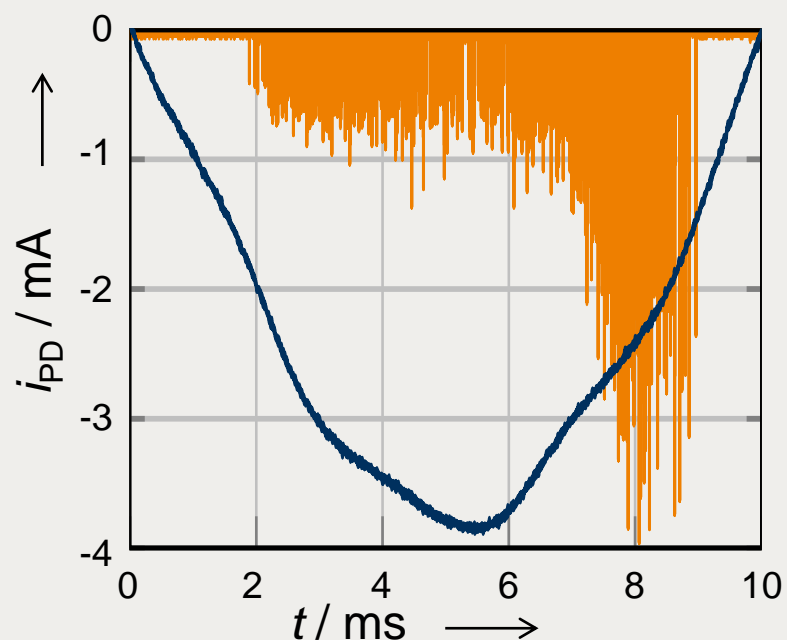
Open Technical Questions Concerning The Application of SF₆ Gas Alternatives

Positive Protrusion

Negative Protrusion

— PD current

— Voltage



- **Positive Protrusion:**
 - Maximum current amplitude in rising edge of the voltage
 - **Negative Protrusion:**
 - Low current amplitudes
 - Pulseless discharge current
- Interpretation of the measurement results
- Handling of pulseless currents during measurement

0.7 MPa_{abs} gas mixture: 3.5 % C4-FN in CO₂ / O₂

Conclusion – How can CIGRE Support?

- Necessity to investigate the PD behaviour of the different SF₆ alternatives
 - Increase the experience with PD behaviour
 - Sensitivity analysis of the conventionally used PD measurement techniques
 - Reliable interpretation of measurement results

- Collection of knowledge from the experts
= creation of a new WG?