Investigations on the DC and AC breakdown strengths of ultra-low density insulating materials for UHV and UHVDC applications

Master and Bachelor Thesis

Due to the considerable insulating distances in UHV (Ultra High Voltage) systems, the only viable solution is to use hollow-core composite insulators (HCI). These insulators can reach heights of 13 meters and must be filled to avoid surface discharges due to humidity ingress. The conventional approach is to fill the inner room of the insulator with SF$_6$ gas. However, the electrical power industry is stopping its use due to its GWP Global Warming Potential.

A novel promising ultra-light material is considered in the framework of this thesis. To characterize this material and its potential use as a solid insulating material, its breakdown strength has to be investigated under AC and DC stresses. The breakdown strength of a dielectric is a reference of the maximum electrical stress that the material can see in service. Preliminary investigations have shown promising results for the low-density filler as a function its composition, which need to be further analyzed and modelled.

Goals and focus of the thesis:
Your focus and core tasks will be:

- Literature research regarding breakdown strength models for solid materials
- Design and manufacture of specimens
- Experimental investigation of the manufactured materials
- Validation of the results by means of simulations

Your Profile:

- Study in Engineering, Business Administration & Engineering or Computer Sciences
- Previous experience regarding laboratory work is advantageous

Contact

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Focus

- Laboratory work
- Low-density materials
- HV engineering
- Breakdown strength