DF 8: Application of dielectric solids

Time: Monday 16:50–17:30 Location: H11

DF 8.1 Mon 16:50 H11

Influence of dielectric nonlinearities on the storable energy of $BaTiO_3$-capacitors — •Tino Band[1], Sebastian Lemm[1], Mandy Zenkner[2], Martin Diestelhorst[1], Albrecht Rost[3], Horst Beige[1], and Stefan Ebbinghaus[2] — [1]Institute of Physics, Martin-Luther-University Halle-Wittenberg, D-06099 Halle, Germany — [2]Institute of Chemistry, Martin-Luther-University Halle-Wittenberg, D-06099 Halle, Germany — [3]University of Applied Sciences Merseburg, 06217 Merseburg, Germany

The concept of energy storage in a capacitor is of great interest in connection with the energy production based on wind energy or solar energy. According to the commonly used linear relation for the energy density $w_{el} = \frac{1}{2}\varepsilon_0\varepsilon E^2$ of an electric field a capacitor may store the total amount of electric energy $W_{el} = \frac{1}{2}CU^2$. The aim is to find dielectrics with high permittivities ε and high dielectric strength to store large quantities of electric energy without increasing the volume of the capacitor too much. At a first glance ferroelectrics are good candidates because of their relatively high values of small-signal dielectric permittivities ε. But it is well known that they are nonlinear dielectrics. We discuss the influence of dielectric nonlinearities on the amount of storable energy. As will be shown the nonlinear dielectric properties reduce the storable energy in ferroelectric capacitors compared to the estimations of the linear model. We present results of detailed hysteresis measurements and charge-discharge measurements on ceramic $BaTiO_3$-samples to demonstrate the limitations of the linear model.

DF 8.2 Mon 17:10 H11

Loss reduction of dielectrics: CVD diamond — •Theo Scherer — Karlsruhe Institut of Technology KIT; Hermann-von-Helmholtz-Platz 1 ; D-76344 Eggenstein-Leopoldshafen

The high-power long pulse RF loss properties of CVD diamond materials for ECR heating and plasma stabilization in large fusion devices have been measured by established Fabry-Perot methods. The dielectric loss is strongly influenced by the surface chemistry of the diamond. Special surface passivation techniques are investigated due to the reduction of the electrical surface conductivity and therefore of the RF losses.