DF 14: Dielectric composites and functionally graded materials; ceramics

Time: Thursday 11:20–12:00 Location: MÜL Elch

DF 14.1 Thu 11:20 MÜL Elch

Dielectric properties of $BaTiO_3$ composites below the percolation threshold due to finite size effects — •Hans Lustfeld[1] and Martin Reissel[2] — [1]Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich and JARA, D52425 Jülich — [2]Fachhochschule Aachen, Abteilung Jülich, D52428, Jülich

The high dielectric permittivity of $BaTiO_3$ can be enhanced further by adding metallic nanoparticles, e.g. Ni[1,2] or Ag[3]. This enhancement becomes high near the concentration c_p of the percolation threshold[4]. Therefore computing dielectric properties close to c_p is of great interest. However, near this limit finite size effects become important for modern **M**ulti **L**ayer **C**eramic **C**apacitors (MLCC's) having a layer thickness of a few μ only. Here we discuss these effects for the dielectric permittivity, energy storage and conductivity using the brick layer model[5] and a modified brick-layer model.

[1] C. Pithan et.al., Int. J. Mater. Res. **97**, 5 (2006)
[2]Y-C. Huang et.al., J. Am. Ceram. Soc., **90**, 1438 (2007)
[3]Y.Cheng et.al., Appl. Phys. Lett. **91**, 252903 (2007)
[4]W.T. Doyle, J. Appl. Phys. **85**, 2323 (1999)
[5]N.J. Kidner et.al., J. Am. Ceram. Soc. **91**, 1733 (2008)

DF 14.2 Thu 11:40 MÜL Elch

Piezoelectric characterisation of single ceramic fibres — •Sabine Kern, Ralf Steinhausen, Christoph Pientschke, and Horst Beige — Martin-Luther-University Halle-Wittenberg, Physics Department, PFM, 06099 Halle, Germany

Ceramic-polymer composites containing embedded piezoelectric ceramic fibres in a polymer matrix are favourable for application as ultrasonic transducers due to their low acoustic impedance, the high electromechanical coupling coefficient, as well as the high aspect ratio of the ceramic part. To optimise the composite's properties, knowledge of the electromechanical properties of the fibre itself is advantageous. A method to measure the piezoelectric strain loops for single ceramic fibres was developed. Using a capacitive displacement sensor, the present measurement method also allows the determination of the low-voltage piezoelectric coefficient d_{33} due to its high sensitivity. Reference measurements had shown that the electromechanical properties were measured with good accuracy. PZT fibres with diameters of 250-750 μm were characterised regarding the high-field bipolar and unipolar strain-field dependence and also the low-field piezoelectric coefficient. Moreover, the dependence of the polarisation regime was studied and discussed.