Institute for Materials Science
Universität Stuttgart

Colloquium Materials Science
Summer Semester 2020
18 May 2020 @ 4:30pm
On-line per WebEx !
Meeting Identification number (Access code):**231 069 386**
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https://kurzelinks.de/mawikolloquium-ss20-kwebber

"Enhancing the Electromechanical Response of Functional Ceramics Films Through Aerosol Deposition of Metal Electrodes„

Prof. Dr. Kyle Webber
Dept. Materials Science and Engineering FAU Erlangen-Nürnberg

Abstract: $(Na_{1/2}Bi_{1/2})TiO_3$-based lead-free ferroelectrics show considerable promise for actuation systems due to a large electromechanical response but are limited by their electrical poling field and relatively low thermal stability. This behavior is largely based on the electric field induced disorder-to-order transition. A number of strategies have been proposed, such as chemical modification and ceramic-ceramic composite structures, which have increased the electromechanical response but also resulted in various additional limitations, e.g., reduction in depolarization temperature or increased porosity. In this presentation, a simple new method will be introduced for increasing the unipolar strain and reducing of poling field as well as an increasing in the depolarization temperature of polycrystalline $(Na_{1/2}Bi_{1/2})TiO_3$-0.07$BaTiO_3$. Room temperature aerosol deposition was used to deposit copper electrodes on the ceramic sample, which resulted in the formation of large biaxial residual stresses during the AD process that induce a long-range ferroelectric order in NBT-7BT. These stresses were found to increase the electromechanical properties as well as the thermal stability of NBT-7BT, which will be shown through macroscopic strain-electric field behavior and the temperature-dependent dielectric response.

The stress-modulated relaxor-ferroelectric transition will be discussed in conjunction with the aerosol deposition process and the development of internal residual stresses in functional ceramics.

Piezoresponse force microscopy will be used to show the evolution of ferroelectric domains in the relaxor NBT-7BT following aerosol deposition, which will be compared to ex situ stress-dependent PFM to provide insight into the stress distribution through the thickness.

Host: Prof. Dr. Oliver Clemens