allied academies

2nd International Conference on

Biomaterials and Nanomaterials &
Materials Physics and Materials Science

May 20-21, 2019 | Vienna, Austria

Giant dielectric response and low dielectric loss in $PbTiO_3$ grafted $CaCu_3Ti_4O_{12}$ ceramics evaluated by impedance spectroscopy

Ali Rajabtabar and **Ommeaymen Sheikhnejad**
AC^2T research GmbH, Austria

There is an ever-increasing tendency to employ Electrochemical Impedance Spectroscopy (EIS) as a strong tool to characterize thin films or ceramic layers demonstrating electrical properties in Tribology. In this regard, colossal dielectric materials with reasonable energy storage and dielectric loss are on the core interest of potential applications in sustainable energy industry. In this study, $PbTiO_3$ (PT) was coated on the surface of $CaCu_3Ti_4O_{12}$ (CCTO) particles via sol-gel method to enhance the characteristics of grain boundary and interface towards efficient application in Capacitors and Supercapacitors.

The X-ray diffraction (XRD) pattern of CCTO/PT ceramics represents the PT phase exists mainly at the interface between the CCTO grains. The field-emission scanning electron microscopy (SEM) images captured from the fracture surfaces confirm the grains were formed in cuboid-like taking regular form with an increase in sintering time. The line scan Energy-Dispersive X-ray Spectrometry (EDS) result demonstrates that PT are slightly substituted in Cu site of CCTO structure. EIS data demonstrates an enhanced dielectric constant in low frequency with low dielectric loss in high frequency for the grafted CCTO composite ceramics (CCTO/PT composite ceramics with the PT weight concentration of 10%) over the entire frequency range. The dielectric loss for the CCTO-30% and -50% PT samples is abruptly decreased to a value of ~0.0013 at 100 kHz. These observations were attributed to the change in characteristics of grains and grain boundaries where the insulating properties of the grain boundaries are improved following the addition of PT.

Speaker Biography

Ali Rajabtabar is Scientist in AC^2T research GmbH where is responsible for data analysis as an experimental materials physicist in the pool of advanced chemical analysis. He graduated in applied physics (B.Sc./M. Sc., Iran) and after 5+years of doing research and teaching physics, he joined Harbin Institute of Technology to pursue his PhD degree in materials physics and chemistry, while he enhanced the characteristics of interface and grain boundary of CCTO based composite ceramics. After a postdoctoral research in China, he moved to Austria as a guest researcher working in ZONA-JKU Linz to learn and employ spectroscopic ellipsometry. Then, as a senior research fellow he was doing EIS measurement, modeling and data analysis on Li-ion battery project of Keysight Technologies GmbH. He could publish even with diverse research background in materials physics. Since his PhD, his focus was placed on energy storage device and materials with growing challenges towards industrial application.

e: ali.rajabtabar@ac2t.at

Notes: