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YBCO- based supercapcitor with ultrahigh dielectric materials

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Dielectric properties and ac- conductivity was studied and correlated with the structure for a series of YBCO ceramic doped with different doping level ranged from 0.1-0.5 wt.% of non-magnetic nano metal oxides, namely CuO and SnO_2. The most important feature of this study is the ultrahigh values of dielectric constant at low frequency exactly 50 Hz, where we found that undoped YBCO has a value of ε' equal to 6.99x106 at 50 Hz which is higher than any other ferroelectric material. The highest value of ε' for doped YBCO samples is recorded for 0.2 wt.% CuO- YBCO whereas for SnO_2 -YBCO the highest value is for 0.4 wt.% Also, the values of ε' depends on the nature and magnetic properties of the doped metal oxides. This work contributes to the materials with ultrahigh dielectric constant, i.e. values of the real part of the permittivity έ exceeding 1000. Since long, materials with ultrahigh dielectric constant are in the focus of interest, not only for pure academic reasons but also because new ultrahigh- έ materials are urgently sought after that the further development of modern electronics. In general, for the miniaturization of capacitive electronic elements materials with ultrahigh –έ are prerequisite. Moreover, ac- electrical conductivity has two frequency dependent regions, the low frequency one where σac is independent on frequency whereas at high frequency region dispersion occurs. All samples are found to follow the universal power law and have a typical fit. The exponent S is less than unity and decreases a little with increasing temperature which suggesting that the hopping of electrons between the barriers is the predominant mechanism for the conduction.

Biography

A M Youssef has completed his PhD from El-Azhar University, Egypt and Post-doctoral studies from National Research Center. He is a Researcher in National Research Center from 2014. He has published more than 9 papers in international journals.

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