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&

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XII WRTCS

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Study of influence of Mn dopant on dielectric response of $SrTiO_3$ ceramics

J. Živojinović[1], D. Kosanović[1], V. P. Pavlović[2], N. Tadić[3], V. B. Pavlović[4]
[1]*Institute of Technical Sciences of the Serbian Academy of Sciences and Arts, Knez Mihailova 35/IV, 11000 Belgrade, Serbia*
[2]*University of Belgrade, Faculty of Mechanical Engineering, Kraljice Marije 16, 11120 Belgrade 35, Serbia*
[3]*University of Belgrade, Faculty of Physics, Studentski trg 12, 11000 Belgrade, Serbia*
[4]*University of Belgrade, Faculty of Agriculture, Nemanjina 6, 11080 Belgrade, Serbia*

The influence of Mn incorporation into the Sr and Ti sites of $SrTiO_3$ ceramics on the structure, microstructure and dielectric tunability was studied. Manganese doped $SrTiO_3$ ceramics with various manganese dioxide weight percentages (1.5, 3 and 6 wt %) were prepared by a solid-state method in the presence of mechanical activation (10, 30 and 120 minutes). According to Ritveld's analysis it was found that the size of the crystallite in doped activated $SrTiO_3$ ceramics is smaller than the size of the crystallite in undoped ceramics. This lower degree of crystallinity is a consequence of additional distortion of the crystal structure due to ion substitution. SEM analysis showed that with increasing dopant concentration in the sample, at the same time as a time of mechanical activation, the grain size decreases, which is explained by the increasingly dominant incorporation of Mn^{4+} ions at sites of Ti^{4+} ions. On the Raman spectra of doped ceramic samples, the appearance of a peak at ~750 cm^{-1} was observed, its change in intensity with the increase of dopant concentration indicates the incorporation of dopant in the $SrTiO_3$ lattice. It was stated that mechanical activation leads to a more pronounced increase in the intensity of the mentioned peak, i.e. that activation leads to effectively higher incorporation of dopant into the strontium-titanate lattice. Higher values of relative dielectric permittivity of doped $SrTiO_3$ ceramics were observed for 1.5 wt %, in relation to inactivated and activated undoped ceramics. Based on all previous analysis, it is estimated that this can be related not only to higher sample densities but also to the contribution of Mn^{2+} ion incorporation at Sr^{2+} ion positions in the lattice. Based on all the above, the optimal electrical properties of $SrTiO_3$ ceramics can be achieved by the appropriate choice of mechanical activation time and dopant concentration.