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3.4.6: Documents for books and chapters in edited volumes published per teacher during the Session 2020-21:

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Electrical and structural characterization of 100 keV N^+ ion implanted Kapton-H polyimide

AIP Conference Proceedings **2265**, 030198 (2020); https://doi.org/10.1063/5.0023335

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ABSTRACT

Kapton-H polyimide implanted with 100 keV N+ ions at the fluence ranging from $1x10^{15}$ to $5x10^{16}$ ions/cm^2 has been characterized through V-I measurement, FTIR and Raman spectroscopic techniques. It has been found that the current increases with the increase of the voltage as well as with increasing ion fluence. The slope of the log (I) – log (V) plots for the highest implanted dose indicates the almost ohmic conduction behaviour in the N^+ implanted Kapton-H. In FTIR-ATR spectra, the intensity of all the vibrational bands monotonically decreased which shows the breaking of various bonds as a result of ion implantation. Further, the Lorentzian fitting among the two bands observed in the Raman spectrum of Kapton-H implanted at the fluence of $5x10^{16}$ N^+/cm^2, depicts their centers at positions 1383 cm^{-1} and 1566 cm^{-1} with their intensity ratio (I_D/I_G) ~0.45. These peak positions and their intensity ratio mark the presence of D and G bands of carbonaceous materials. Thus, the observed changes in electrical behaviour may be attributed to the formation of a cross-linked conjugated carbonaceous structure in the near surface region of Kapton-H after N^+ ions implantation.

Thermal and structural characterization of Bi and Cu Co-doped BCZT

AIP Conference Proceedings **2265**, 030012 (2020); https://doi.org/10.1063/5.0017695

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ABSTRACT

In our present work, $Ba^{0.98-3x/2}Bi^{x}Ca^{0.02}Zr^{0.02}Ti^{0.976}Cu^{0.008}O^{3}$(abb. as BCZTCuBi^{x}) lead free ferroelectric ceramics have been synthesized via solid state reaction method. TGA-DSC and XRD techniques have been used to characterize these lead free ceramic samples. From the TGA-DSC analysis of BCZTCuBi^{x} with x = 0.01, it is clear that the weight loss became stable after 1000°C, which is an indication of the fact that the reaction has completed up to this temperature. Such observations give a fair estimation of the calcination temperature for BCZTCuBi^{x} ceramic samples. The XRD analysis confirms the formation of perovskite structure with tetragonal symmetry for the calcined as well as forthe sintered samples. Further, the crystallite size of calcined sample was found to be decrease from 32.26 nm to 29.96 nm with increase in doping content of 'Bi' from x=0 to x=0.02, which may be ascribed to the distortion in the lattice caused by the difference in the ionic radii of dopants and host ions in BCZT.

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Thermo-gravimetric and XRD analysis of KNN-based lead-free ceramics

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ABSTRACT

Environment protection and Human health concern is the driving force to eliminate the lead from commercial piezoelectric materials. Among lead-free ferroelectric ceramics, Potassium-sodium niobate (K_xNa_{1-x}) NbO_3 (KNN) based ceramics have gain much attention as one of the effective alternatives for replacing lead-based ones. In the present study, we have synthesized $0.96(K_{0.48}Na_{0.52})_{1-3x}Nd_xNb_{0.96}Sb_{0.04}O_3$-$0.04(Bi_{0.5}K_{0.5})$ $(Zr_{0.9}Sn_{0.1})$ O_3 (abb. as KNNNxS-BKZS) [x=0, 0.002 and 0.004] by a conventional solid-state reaction method. Thermal behaviour of mixed powders has been studied through TGA-DSC analysis to estimate the calcination temperature. TGA curve shows that, above 770°C, the decomposition of carbonates has completed and no significant weight loss has been observed after this temperature. A perovskite structure has been revealed in calcined as well as sintered ceramics through XRD analysis. The maximum crystallite size of calcined powders found to be ~14.00 nm for x=0.002. Further, the crystallite size of the calcined powder for x=0 composition has been found to increase from ~12.47 nm to ~17.37 nm after sintering.