SIMPLE MODEL OF SBN SINGLE CRYSTAL – ELECTRODE INTERFACIAL LAYER

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To determine dielectrical properties of the SBN ($Sr_{3/4}$ $Ba_{1/4}Nb_2O_6$) bulk and bulk-electrode interface, we have investigated dependence of the dielectric response capacitance C and dielectric loss tangent ($\tan\delta$) on the thickness at temperatures both below and above the maximum of dielectric constant of the material, which occurs at $T_m \approx 50$ °C (10 kHz).

To obtain information on contact properties of electrodes we have calculated bulk and surface contributions from the thickness dependence of the complex impedance.

Both parallel and perpendicular to the ferroelectric c-axis the measured dielectric constant increases with the increase of sample thickness suggesting, in a superficial point of view, that a low permittivity surface (contact) layer masks the bulk dielectric properties. On the other hand, the temperature dependence of the surface capacitance qualitatively resembles the bulk behavior, which contradicts to the flat response expected.

In order to validate the kinds of inhomogeneities possible we simulate the sample with a cylindric net of complex impedances. The values of R, e.g., $\tan\delta$ and C were taken equal to the experimentally determined dielectric permittivity ε and $\tan\delta$ for the bulk perpendicular and parallel to c-axis, correspondingly. Different surface layers were proved to vary the values of R and C in the surface layer. The calculation of the cylindric net of complex impedances consisting holes, conducting elements, and turned R-C elements at electrodes yielded qualitatively agreeable results. The character of $C_s(T)$ and $\tan\delta_s(T)$ is similar to the experimental and computer-simulated results.

A reasonable explanation for the empirical dielectric response is that the transport properties within the metal - SBN - junction are determined by electrical inhomogeneities macroscopically resulting in a deficiency of *surface volume* contributing to the response.

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