Electroinduced anisotropy in phonon crystals by crossed electrode structure

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The possibility of creating phonon crystals with management parameters of the induced structure was interest in a sciences many years ago. There are different possibilities of the induced domain structure in phonon crystals by external action. It is may be laser beam or magnetic field. But the simplest for the operation and flexibility it is the electroinduced method formation of anisotropy in a volume of the crystals. In this work was shown the results investigation of creating electroinduced anisotropy in phonon crystals with crossed electrode structure.

We are investigating the possibility of the formation a stable domain structure in a single crystal -36˚ rotation Y-cut $LiTaO_3$. In this type of the crystal it is possible to transmit low velocity SH wave and we can measure the interaction between SH wave and induced domain structure. By finite element methods was investigated different crystal thickness and distance between electrodes. Were obtained results of the displacement and piezoelectric crystal polarization for a constant electric field 100V/cm and crystal thickness 350 μm. In figure 1 and 2 shown the results of modeling electrode structure with optimal parameters in COMSOL software.

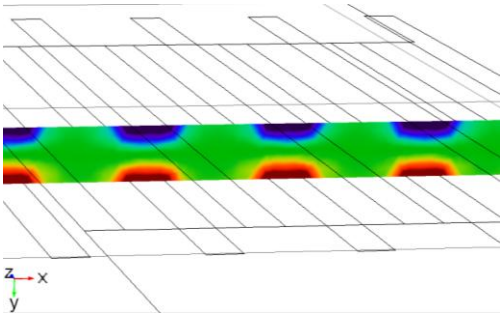

Fig. 1 - The results of the displacement field in a volume

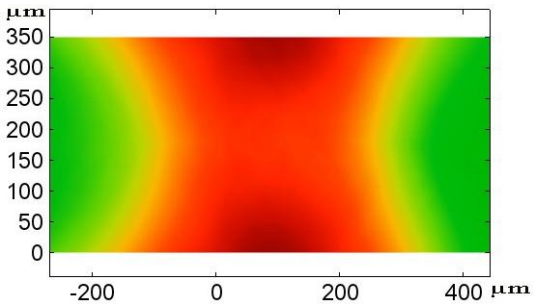

Fig. 2 - The results of the piezoelectric polarization in a crystal

According to the simulation results we can conclude, that a stable picture of the formation of domain structure with the ultimate polarization it is possible if the distance between the electrodes is equal or larger than thickness of the piezoelectric substrate. Near of the electrodes, the total deformation at the each of the electrodes is an addition and form fuzzy structure of the total polarization. This phenomenon is a consequence the homogeneity of the displacement, generated by the electric field.

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