Domain Wall Orientation and Domain Shape in $KTiOPO_4$ Crystals

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We present a detailed study of the domain kinetics in ferroelectric potassium titanyl phosphate $KTiOPO_4$ (KTP) single crystals with high temporal resolution in wide range of external electric fields supplemented by visualization of the static domain structures with high spatial resolution.

Domain shape evolution and domain wall motion have been studied in KTP single crystals using complementary experimental methods, including *in situ* optical visualization of the domain structure evolution [1]. The *in situ* visualization of domain kinetics has allowed revealing: (1) qualitative change of the domain shape, (2) dependence of the domain wall velocity on its orientation, (3) jump-like domain wall motion caused by domain merging, (4) effect of domain shape stability. The sideways motion velocities of different domain walls were measured. The effect of domain shape fast recovery after merging of isolated rhombus domains was discovered.

The model of domain wall motion driven by generation of elementary steps (nucleation ща kink-pair) and subsequent kink motion is presented. The decrease of the relative velocity of the approaching parallel domain walls is attributed to electrostatic interaction. The effect of polarization reversal induced by chemical etching is observed [1]. The self-assembled formation of submicron width lamellar domains under application of the uniform electric field has been demonstrated.

The revealed effect of slow polarization reversal by kink motion only induced by chemical etching was attributed to the action of the low residual depolarization field appeared as a result of partial removing of the screening charge layer during etching. The obtained effect is similar to rearrangement of domain structure induced by chemical etching discovered previously in MgO-doped stoichiometric lithium tantalate single crystals [2].

The obtained results are important for development of domain engineering in the crystals of KTP family and can be used for manufacturing of the periodically poled KTP crystals for light frequency conversion with improved parameters [3,4].

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