# DOMAIN WALL SHAPE INSTABILITY IN CONGRUENT LITHIUM TANTALATE DURING SWITCHING BY ION BEAM

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The investigated samples were represented by 0.5-mm-thick Z-cut congruent LT wafer. The $Z^+$ polar surface before irradiation was covered by 500-nm-thick layer of photoresist. The solid 100-nm-thick Cu electrode was sputtered on $Z^-$-surface and grounded during irradiation. The irradiation was performed by scanning electron microscope Auriga Crossbeam (Carl Zeiss) attached with electron-beam lithography system Elphy Multibeam (Raith). The created domains after chemical removing of resist layer and electrode were visualized at the polar surface by scanning electron microscopy (SEM) after selective chemical etching in pure HF [1,2] and by piezoresponse force microscopy (PFM) without etching.

The formation of domain arrays induced by ion beam irradiation and domain wall shape instability effect were studied. The nonlinear dose dependence of the circular domain radius was revealed. The obtained wide dispersion of domain radii in arrays was attributed to additive impact of injected charges to the total electric field. The domain shape distortion at high doses was attributed to interaction of domain walls with earlier created domains. The domain wall shape instability (appearance of periodical fingers oriented mainly along X direction) was obtained for doses above 20 pC. The increase of the fractal dimension with dose was attributed to increase of the finger lengths, while the finger number remained approximately constant during domain growth.

All obtained results were explained by kinetic approach based on analogy with first order phase transitions. The isotropic domains growth was a result of stochastic nucleation due to prevailed isotropic screening mechanism caused by injected ions and holes generated by electron-hole process due to ions collision with the irradiated sample. The domain wall shape instability was due to electrostatic interaction between approaching domain walls leading to a screening retardation in highly nonequilibrium switching conditions caused by existence of the surface dielectric layer.

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