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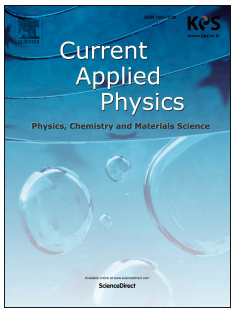

Electric-field-induced evolution of domain shapes in polarization reversal of $BiFeO_3$ (111) capacitors

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Electric-field-induced Evolution of Domain Shapes in Polarization Reversal of $BiFeO_3$ (111) Capacitors

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Abstract

Relying on an external electric field, the shape of propagating domains evolves in polarization switching of ferroelectric $BiFeO_3$ (111) capacitors. With an increasing negative switching bias, it is shown that the domain pattern during ferroelectric domain growth evolves from a circular shape to a dendrite-like shape. Electrical current measurements for different poling states reveal that holes are easily injected through the $BiFeO_3/SrRuO_3$ interface under a negative voltage bias. It is found that holes injected by large negative-switching-pulse fields facilitate domain nucleation in $BiFeO_3$ (111) films and thereby, the promoted domain nucleation drives the shape of switched domains to be dendrite-like.

Keywords: Ferroelectrics, Polarization switching dynamics, Charge injection, Piezoresponse force microscopy, $BiFeO_3$