

**Domain configuration, phase transition and local switching behavior
in as-grown 0.67 Pb(Mg_{1/3}Nb_{2/3})O₃-0.33 PbTiO₃ single crystal
revealed by Piezoresponse force microscopy**

V. Ya. Shur¹, Qingyuan Hu¹, D.O. Alikin¹, A.P. Turygin¹, Xiaoyong Wei²

¹*School of Natural Sciences and Mathematics, Ural Federal University, Ekaterinburg 620000, Russia*

²*Electronic Materials Research Laboratory, Key Laboratory of the Ministry of Education & International Center for Dielectric Research, Xi'an Jiaotong University, Xi'an 710049, China*

Domain configuration in morphotropic phase boundary composition, Pb(Mg_{1/3}Nb_{2/3})O₃-0.34PbTiO₃ (0.67PMN-0.33PT), single crystal have been investigated by Piezoresponse force microscopy.

The coexistence of monoclinic M_A and M_C phases in such 0.67PMN-0.33PT single crystal is visualized in Piezoresponse force microscopy and confirmed in the successively performed Polarized micro-Raman measurement. The temperature induced phase transition behavior is also investigated by Piezoresponse force microscopy. The M_A-type domains still exhibit pronounced signal at 250°C, whereas the M_C-type domains disappears at the Curie temperature. Piezoresponse hysteresis loops acquired from different domains indicate distinctive local switching characteristics. Moreover, the tip-induced domain growth and relaxation kinetics are also investigated. The results mentioned above indicate that the MPB composition, 0.67PMN-0.33PT, has a combination of relaxor and ferroelectric state, which is considered as the origin of its high piezoelectric performance.