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Ferroelectric domain structures near the morphotropic phase boundary in the piezoelectric material $\text{Pb}(\text{Zr}_{1-x}\text{Ti}_x)\text{O}_3$ T. ASADA, NISSAN ARC, LTD., Y. KOYAMA, Waseda University — In the simple perovskite oxide $\text{Pb}(\text{Zr}_{1-x}\text{Ti}_x)\text{O}_3$, an excellent piezoelectric response was obtained in the vicinity of a morphotropic phase boundary (MPB) between the ferroelectric monoclinic (F_M) and rhombohedral (F_R) phases. To understand the origin of the excellent response, we have investigated the detailed features of ferroelectric domain structures near the MPB in PZT by transmission electron microscopy. In the F_M side of the MPB, as a result, there were two types of domain structures at room temperature. On the other hand, a usual domain structure having the 109° and 180° boundaries existed at room temperature in the F_R side. The notable feature is that each domain in the F_M and F_R domain structures near MPB can be identified as an aggregation of nanometer-sized domains with an average size of about 10 nm. Based on this feature, we propose a new concept of an aggregation-type domain structure for ferroelectric domain structures near the MPB.

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