X-ray and Neutron Scattering Study of *as-grown* $Pb(In_{1/2}Nb_{1/2})O_3$ Single Crystals

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Characters of static and dynamic structures of *as-grown* $Pb(In_{1/2}Nb_{1/2})O_3$ (PIN) at room temperature (RT) have been investigated by a complementary use of x-ray and neutron scatterings. The PIN crystal has different chemical ordering (S_2 = 0 ~ 1) in the arrangement of In^{3+} and Nb^{5+} on the B-site by a different thermal treatment.

The diffuse scatterings showing the relaxor state have been observed in the outer-layer of the crystals, while *h/4 k/4 0* reflections showing the long-range antiferroelectric (AFE) state in the inside [1,2]. Phonon dispersion of the as-grown PIN crystals has also been measured, which is the first time for the PIN series. We have measured two transverse optic modes (TO1 and TO2) at zone center and concluded that the major part of the as-grown crystal at RT is ferroelectric(FE). This is consistent with the dielectric measurement performed on the as-grown PIN crystal [3].

These results show that the degree of B-site order S_2 is widely distributed in the as-grown PIN crystal from S_2 = ~ 0 to ≥ 0.7. That is, the AFE grain locates in the FE matrix, while the outer-layer is Relaxor in the as-grown PIN.

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