Supplementary information

## Enhanced polarization by coherent heterophase interface between polar and non-polar phases

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**Figure S1.** Schematic illustration of the TEM specimen (3 mm diameter) for electrical biasing in the in-situ TEM experiment



**Figure S2.** Bipolar strains from 94BNKT-6BA and 94BNKT-6BA + 20 vol% f-BNKT as a function of the applied electric field



**Figure S3**. DF image of a non-polar single phase grain taken using ½ (031) superlattice reflection



**Figure S4.** TEM micrographs of a core-shell type grain when an external electric field of (a) 0 kV/mm (b) 1 kV/mm and (c) 2 kV/mm was applied. (d) TEM image after removing the external electric field. SADPs taken in the core region with the [013] zone-axis (e) at 0 kV/mm, (f) at 2 kV/mm, and (g) after removing the external electric field. The electrical domain switching is highlighted by the red-colored region.



**Figure S5.** Schematic illustrations of (a-b) poling and (c-d) depoling process in polar/nonpolar phase. Gray arrows indicate internal electric field produced by electric polarization of the polar phase.