Electronic Supplementary Information

Experimental detail

The hydrothermal reaction was carried out in a homemade Teflon-lined stainless-steel autoclave. All chemicals of analytical grade were used as received without any further purification.

A typical synthesis experiment starts with dissolving 1.99 g Pb(NO\textsubscript{3})\textsubscript{2} in 10 mL distilled water. Whilst stirring, the prepared Pb(NO\textsubscript{3})\textsubscript{2} transparent solution was added to ammonia solution drop by drop to obtain lead hydroxide precipitates. After washing and filtering with distilled water for six times, the prepared lead hydroxide precipitates were dispersed in a distilled water under vigorous magnetic stirring, followed by the addition of 0.47 g P25-TiO\textsubscript{2} powders, 2.244 g KOH pellets, and 13.6 g NaNO\textsubscript{3} crystals, which form a suspension. After continuous stirring for 2 h, the suspension as feedstock was poured into a 50 ml Teflon-lined stainless-steel autoclave for hydrothermal treatment. In the final feedstock suspension, a KOH concentration of 1 mol/L and a NaNO\textsubscript{3} concentration of 4 mol/L were created. The autoclave was sealed and maintained at 200 °C for 16 h, and then cooled to room temperature in air. The resultant products were filtered and washed with distilled water and absolute ethanol for several times. The resultant white powder was oven-dried in air at 80 °C for 12 h. In order to investigate the formation mechanism of the PbTiO\textsubscript{3} nanosheets, a reference PbTiO\textsubscript{3} powder was also synthesized via a similar hydrothermal route by introducing KNO\textsubscript{3} and LiNO\textsubscript{3} as additives into the hydrothermal system instead of NaNO\textsubscript{3}, respectively.

The chemical composition of the PbTiO\textsubscript{3} samples has been determined by chemical analysis using inductively coupled plasma-atomic emission spectroscopy (ICP-AES). The composition of the PbTiO\textsubscript{3} samples varies slightly from batch to batch. The ratio of Pb to Ti can vary from 0.98:1 to 1:1.

X-ray diffraction was performed on a Rigaku X-ray diffractometer (XRD) with high-intensity CuKα radiation (λ=1.5406 Å) and step interval of 0.02 as well as scanning speed of 4 °/min. Field emission scanning electron microscopy (FESEM) images were taken with a Hitachi SU-70 scanning electron microscope. Transmission electron microscopy (TEM) images and selected area electron diffraction (SAED) patterns were obtained with JEOL 200CX TEM using an acceleration voltage of 100 kV. High-resolution TEM (HRTEM) images were taken with a JEOL-2010 HRTEM using an acceleration voltage of 200 kV.

**Fig. S1** EDS spectrums caught from the single whole PbTiO\textsubscript{3} nanosheet dominant with (a) (001) facets, and (b) (111) facets by the energy dispersive spectrooscope attached with the JEOL 200CX TEM.
The corresponding EDS spectrums (Fig. S1) indicate that the PbTiO$_3$ nanosheets consist of Pb, Ti, and O with a ratio of about 1:1:3, agreeing well with the nominal composition of PbTiO$_3$.

**Fig. S2** An overview SEM image of the hydrothermally synthesized samples assisted with NaNO$_3$ additives.

![SEM image of hydrothermally synthesized samples assisted with NaNO$_3$ additives](image)

An overview SEM image reveals that the samples hydrothermally synthesized assisted with NaNO$_3$ additives consist of nanosheets and cubic crystals with faint edges. Obviously, the addition of NaNO$_3$ induces a lot of PbTiO$_3$ perovskite nanosheets.

**Fig. S3** (a) XRD pattern and (b) SEM image of the hydrothermally synthesized samples assisted without any NaNO$_3$ additives.

![XRD pattern and SEM image of hydrothermally synthesized samples assisted without NaNO$_3$ additives](image)

The XRD pattern and the SEM images indicate that as the hydrothermal synthesis is carried out without any NaNO$_3$ additive the synthesized PbTiO$_3$ samples are of cubic particles with faint facets.
The XRD pattern indicates that due to the LiNO$_3$ addition after hydrothermal treatment few tetragonal PbTiO$_3$ perovskite phase is checked out from the obtained samples. Moreover, the obtained samples are composed of nanoparticles with a size of about 40-50 nm. It is evident that the addition of LiNO$_3$ effectively inhibits the formation of PbTiO$_3$ perovskites, displaying different effect with the addition of NaNO$_3$ and KNO$_3$.