Supporting Information

Suppressed polarization by epitaxial growth of $SrTiO_3$ on $BaTiO_3$ nanoparticles for high discharged energy density and efficiency nanocomposites

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Materials

Barium hydroxide octahydrate ($Ba(OH)_2 \cdot 8H_2O$), strontium hydroxide octahydrate ($Sr(OH)_2 \cdot 8H_2O$), sodium hydroxide (NaOH) and titanium tetrachloride ($TiCl_4$). All chemicals were of analytical grade and were purchased from Sigma-Aldrich Co. LLC, China. They were used in the experiments without any further purification.

Synthesis of $BaTiO_3$@$SrTiO_3$ core-shell nanoparticles

A typical synthetic route by two-step hydrothermal reaction was used for $BaTiO_3$@$SrTiO_3$. Briefly, 2.1809g $Ba(OH)_2 \cdot 8H_2O$ was added into 24 mL 1M ethanoic acid solution to obtain solution A. 0.8 mL $TiCl_4$ was added into 16 mL alcohol to obtain solution B. 0.0967g $Sr(OH)_2 \cdot 8H_2O$ was dissolved in 16 mL 1M ethanoic acid solution named solution C. The precursors containing $BaTiO_3$ nanoparticles and unreacted gels were obtained at the first stage by adding an excess of solution B and 5.0 g NaOH to solution A and mechanically stirring for 10 min. Then the solution C was added into the precursors and mechanically stirred to get a uniform mixture. To proceed to the second stage, the mixture was loaded into autoclave and hydrothermally synthesized at 200℃ for 24 h to prepare core-shell nanoparticles. After the synthesis, the particles were washed with ethyl alcohol absolute twice and dried at 80℃ for 24 h.

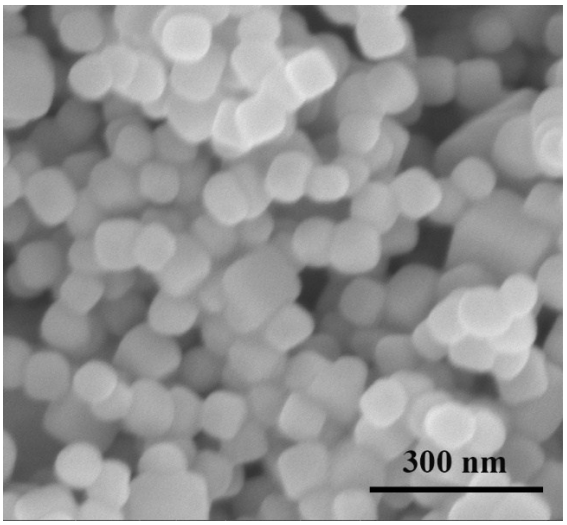

Fig.S1 SEM image of $BaTiO_3$ NPs.

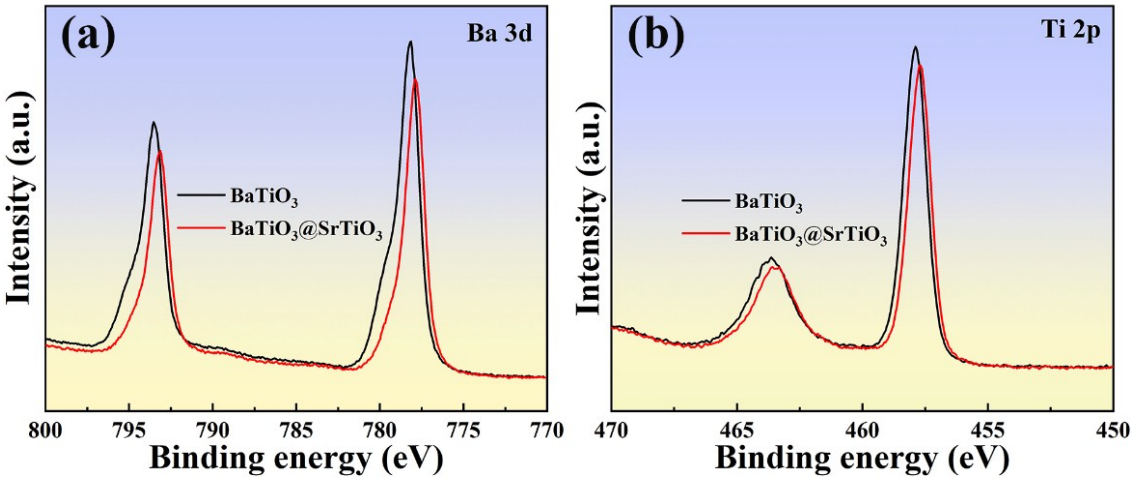

Fig.S2 XPS spectra of $BaTiO_3$@$SrTiO_3$ NPs and $BaTiO_3$ NPs: (a) Ba and (b) Ti.

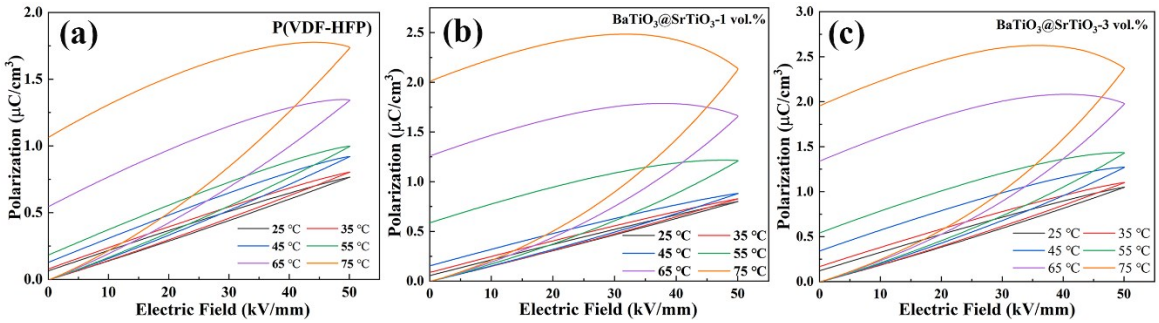

Fig.S3 P-E loops of (a) P(VDF-HFP), (b)(c) $BaTiO_3$@$SrTiO_3$/P(VDF-HFP) nanocomposites (filler content: 1 vol.%, 3 vol.%) in different temperature (25 ℃-75 ℃).

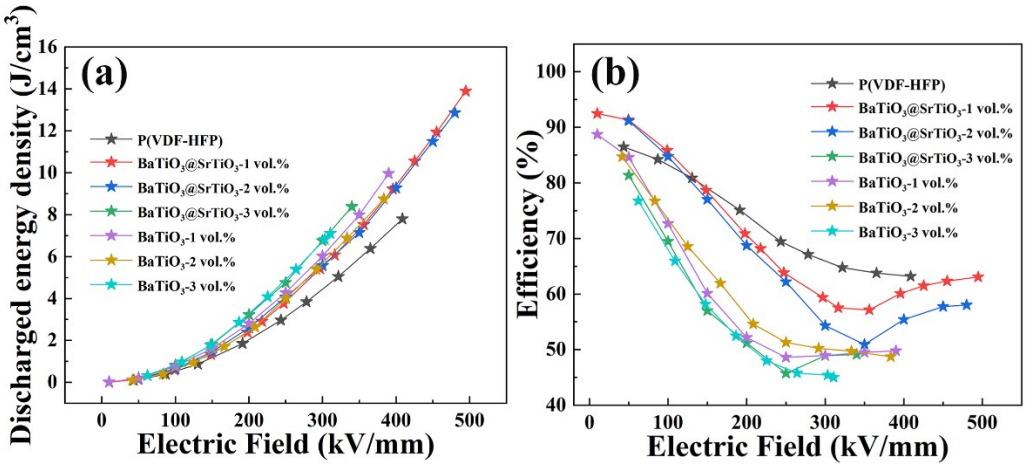

Fig. S4 (a) Discharged energy density and (b) efficiency of P(VDF-HFP), $BaTiO_3$@$SrTiO_3$/P(VDF-HFP) and $BaTiO_3$/P(VDF-HFP) nanocomposites (1 vol.%, 2 vol.%, 3 vol.%).

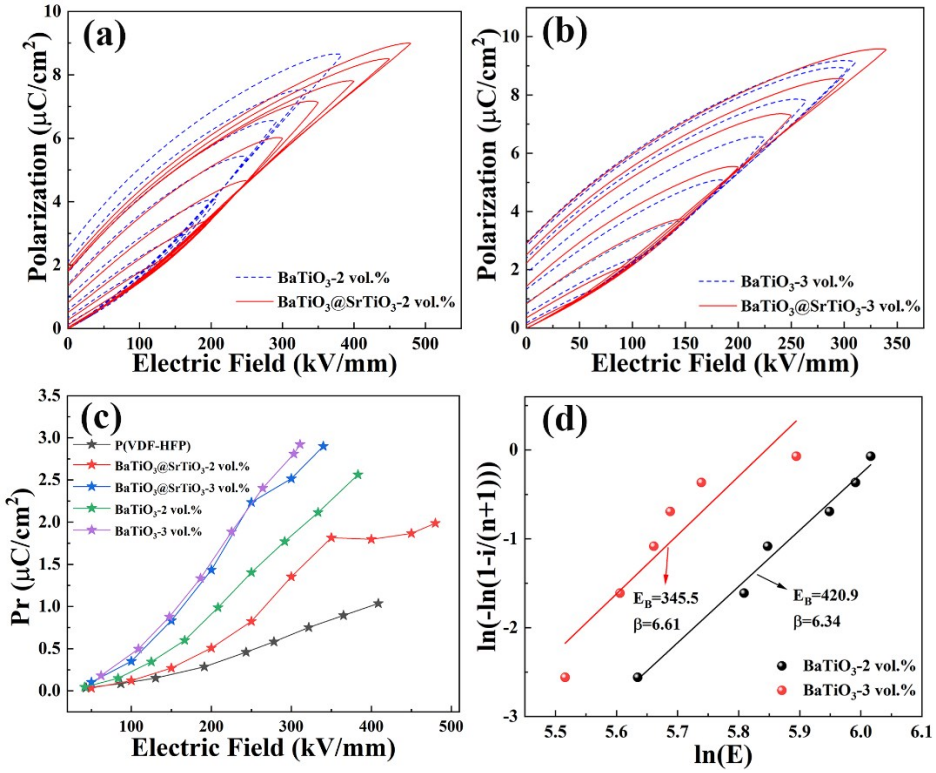

Fig. S5 (a)(b) P-E loops, (c) remanent polarization and (d) Weibull plots of $BaTiO_3$@$SrTiO_3$/P(VDF-HFP) and $BaTiO_3$/P(VDF-HFP) nanocomposites (2 vol.%, 3 vol.%).