

Supplementary Information for

Flexible e-Skin based on micro-structured PZT thin film via low-temperature PLD method

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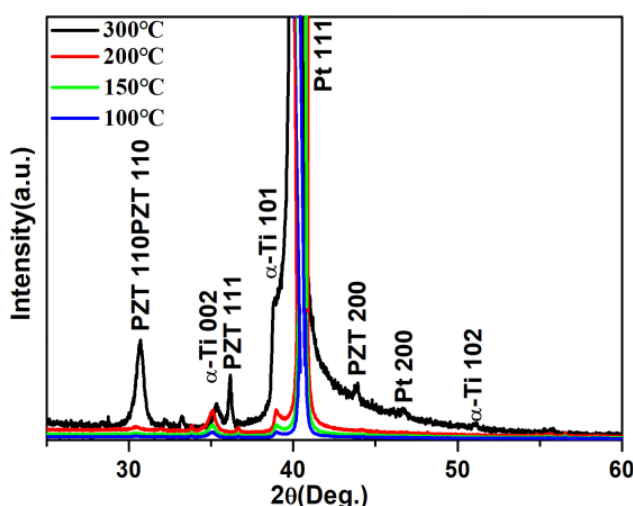


Figure S1 XRD comparison of four sets of different deposition temperature series

It could be clearly seen that there were many raised triangular or spherical particles on the surface of the PZT high crystal film, indicating ununiform film (Figure S2(a)). The elemental contents of these particles were analyzed by EDS spectroscopy. The results showed that the composition of these particles was identical to that of the PZT film itself (Figure S2(b)). These results verified that these protrusions were small PZT particles formed during the preparation process. The formation might be the closed to the vacuum chamber, which did not reach the ideal state in the annealing stage, that was to say, a certain difference existed in oxygen pressure at various internal locations, and the temperature was not evenly distributed, eventually resulting in the formation of raised small particles.

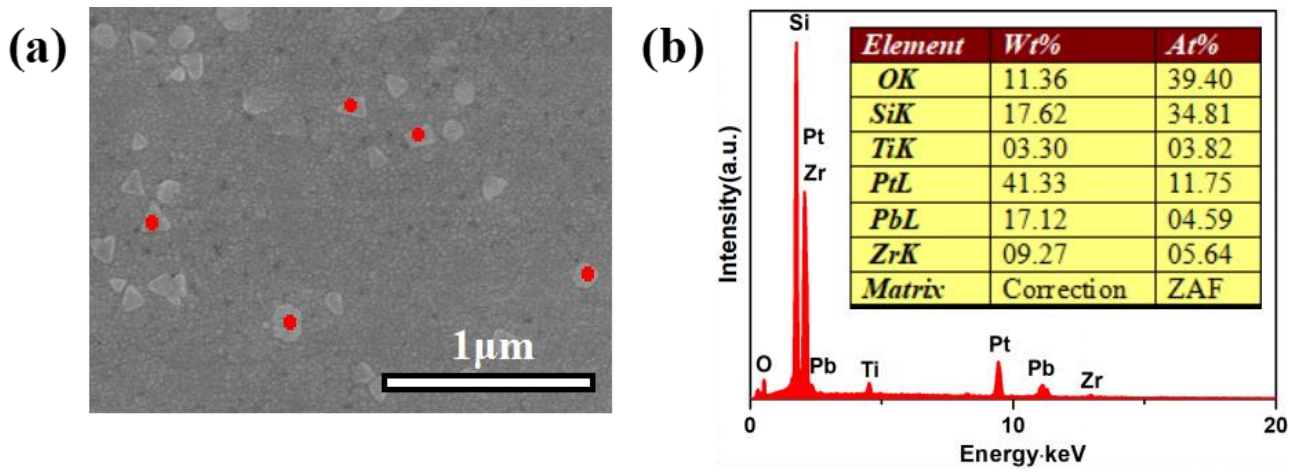


Figure S2 (a) ESEM of the PZT surface. (b) EDS elemental analysis of raised particles on the surface of PZT film

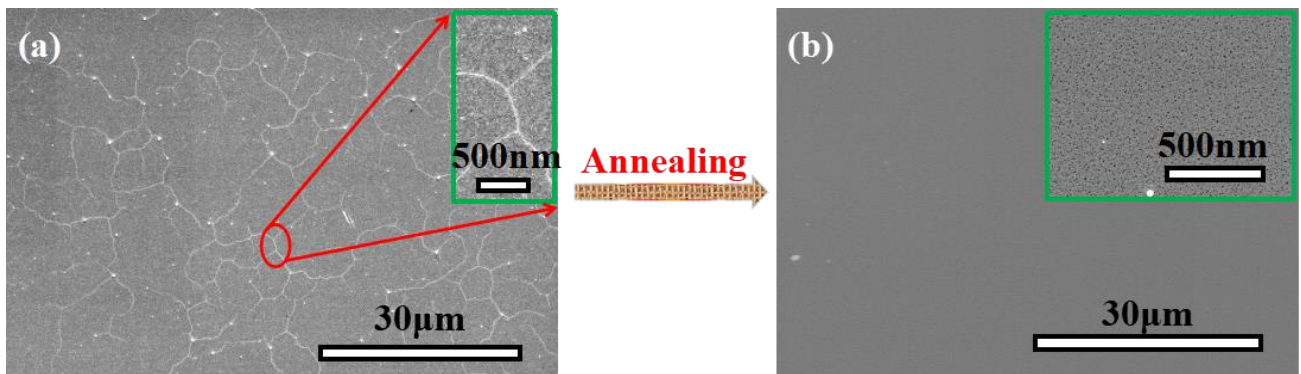


Figure S3 ESEM image before (a) and after (b) multiple cross annealing. conditions: 750°C deposition temperature, 550°C annealing temperature

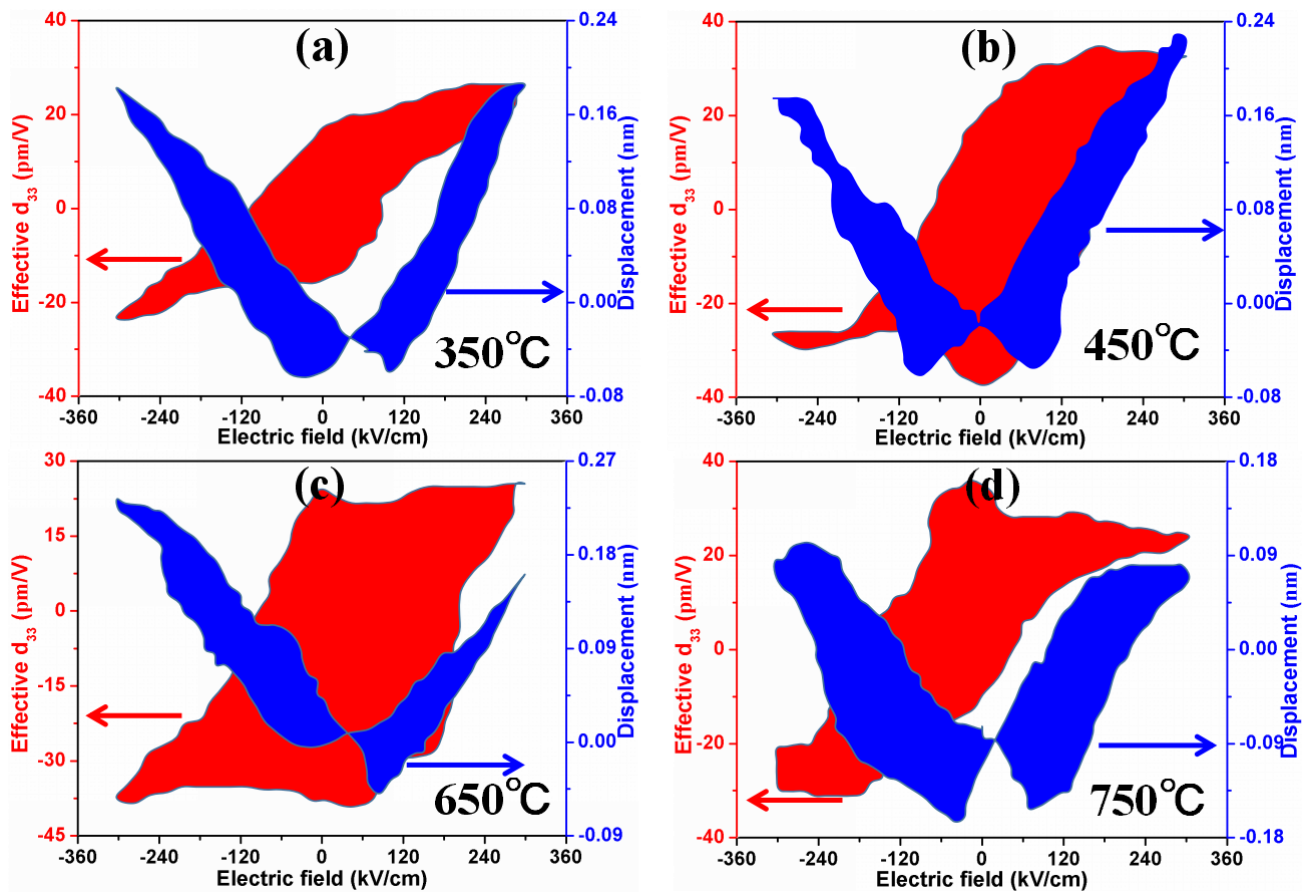


Figure S4 Piezoelectric butterfly curves and hysteresis loops under different annealing temperature series. (a) 350 °C, (b) 450 °C, (c) 650 °C and (d) 750 °C

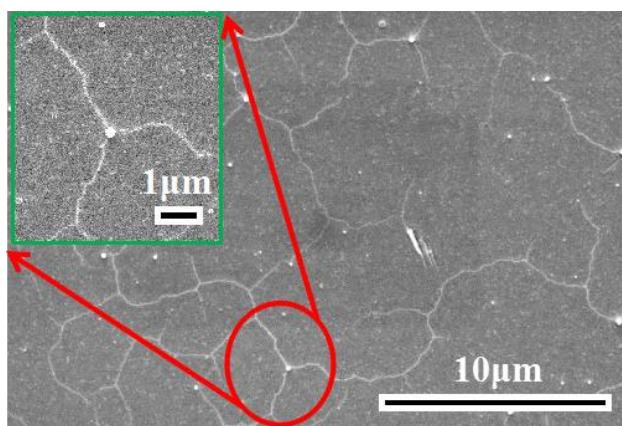


Figure S5 The surface morphology of the corresponding PZT film after 45° bending for 15000 cycles