

Supporting Information

Epitaxial ferroelectric Hf_{0.5}Zr_{0.5}O₂ thin film on buffered YSZ substrate through interface reaction

*Tao Li^{a,b,c}, Nian Zhang^d, Zhenzhong Sun^a, Chunxiao Xie^a, Mao Ye^e, Sayantan Mazumdar^a
Longlong Shu^b, Yu Wang^b, Danyang Wang^f, Lang Chen^f, Shanming Ke^{b,f,*}, and Haitao Huang^{c,*}*

^a School of Mechanical Engineering, Dongguan University of Technology, Dongguan 523808, PR China

^b School of Materials Science and Engineering, Nanchang University, Nanchang 330031, PR China

**E-mail: keshanming@gmail.com*

^c Department of Applied Physics and Materials Research Center, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, PR China

**E-mail: aphhuang@polyu.edu.hk*

^d Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai 200050, PR China

^e Department of Physics, South University of Science and Technology of China, Shenzhen 518055, PR China

^f School of Materials Science and Engineering, The University of New South Wales, Sydney, New South Wales 2052, Australia

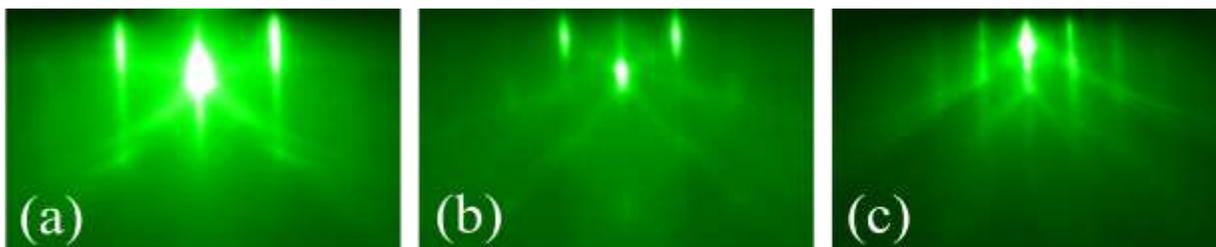


Figure S1 RHEED patterns of YSZ substrates with different orientations: (a) [100], (b) [110], and (c) [111].

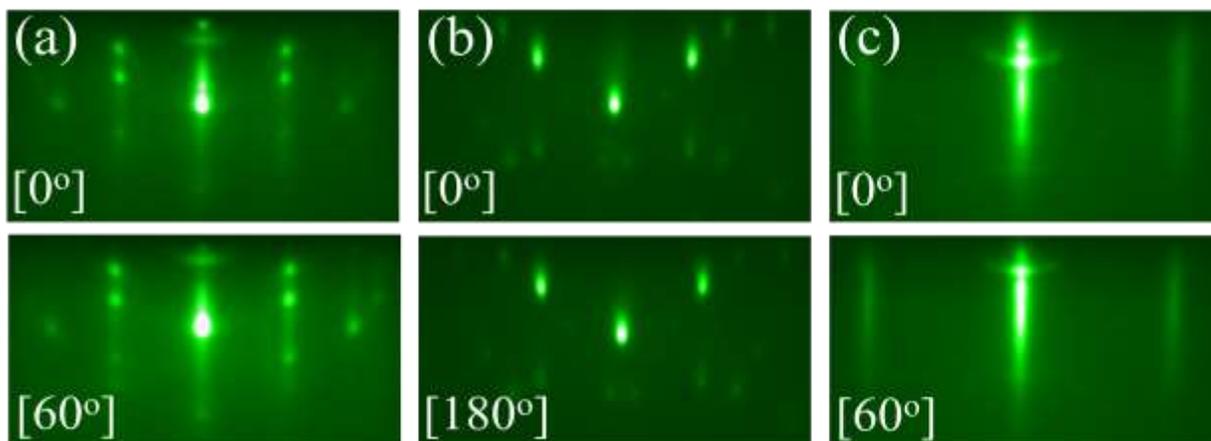


Figure S2 RHEED patterns of TiN grown on (a) $\text{YSZ}_{[100]}$, (b) $\text{YSZ}_{[110]}$, and (c) $\text{YSZ}_{[111]}$ along different azimuthal rotation. The 0° denotes the initial azimuthal rotation.

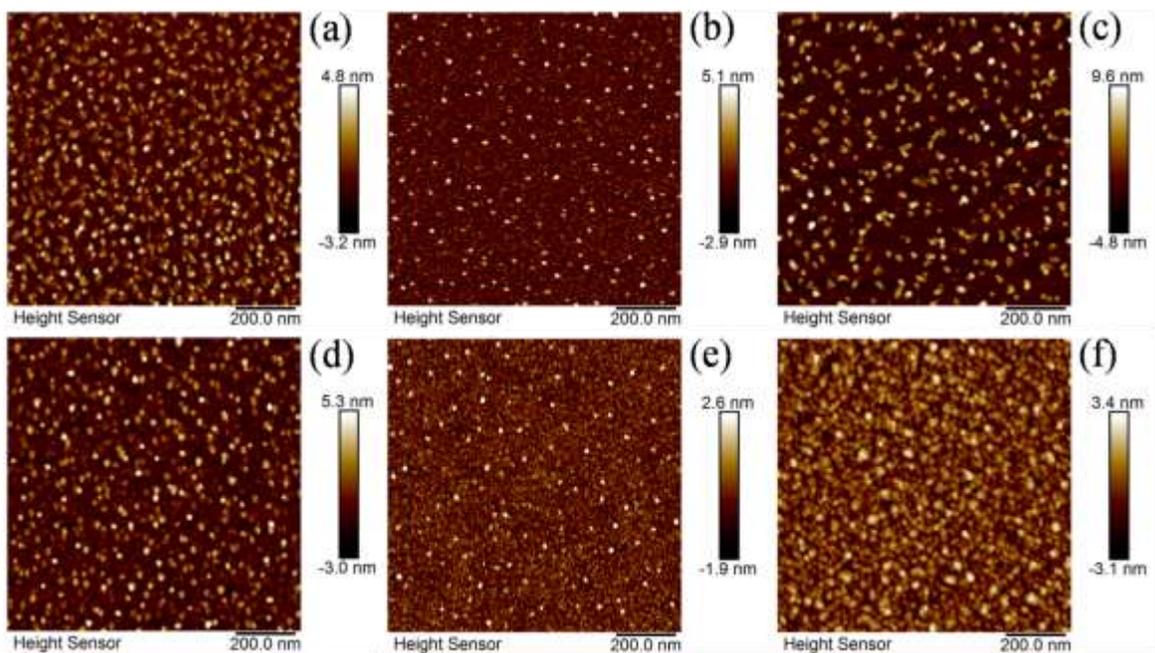


Figure S3 AFM images of TiN films grown on (a) YSZ_[100], (b) YSZ_[110], (c) YSZ_[111] substrates. (d-f) the corresponding AFM images of HZO films deposited on the above TiN.

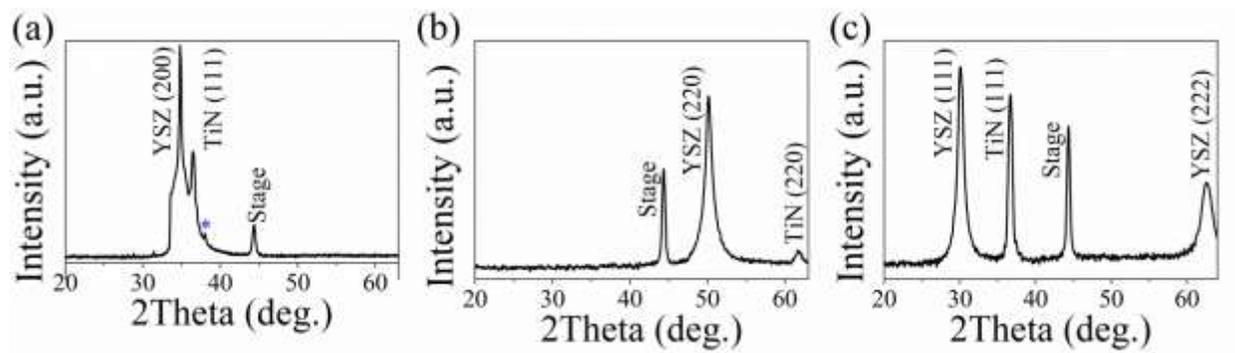


Figure S4 XRD patterns of TiN films prepared by PLD on $\text{YSZ}_{[100]}$, $\text{YSZ}_{[110]}$, and $\text{YSZ}_{[111]}$ substrates respectively identified the TiN different growth speeds. All TiN films grew 5000 laser pulses (5000P) with the laser fluence of $0.65 - 1.0 \text{ J cm}^{-2}$ and the laser repetition rates are 5 Hz.

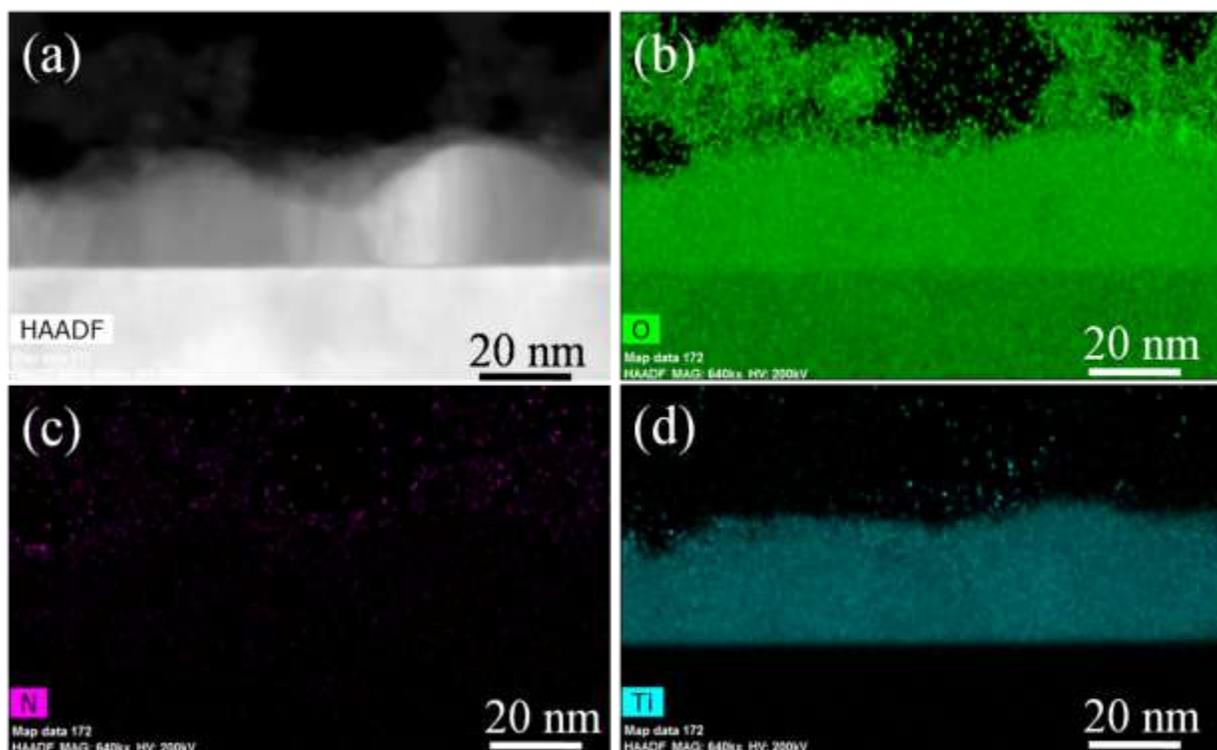


Figure S5 (a) HAADF-STEM image and (b-d) EDS mapping of the TiO_2/YSZ heterostructure

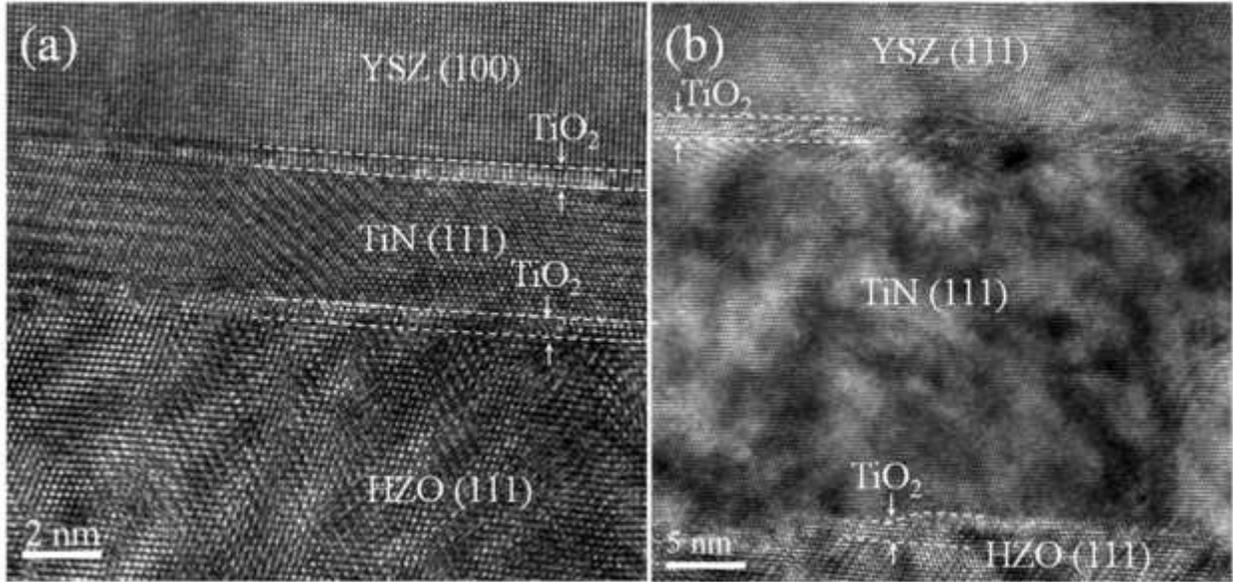


Figure S6 High-resolution TEM micrographs of the epitaxial interfaces of HZO/TiN and TiN/YSZ. Crystalline TiO₂ layer can be seen clearly.