

Supporting Information

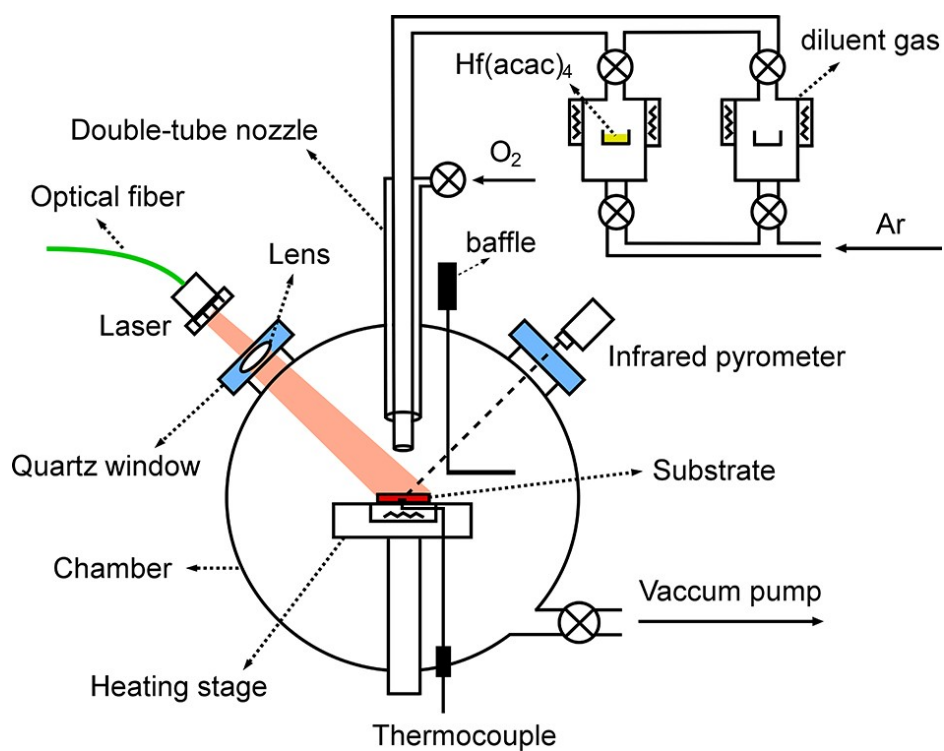


Fig. S1. The schematic of the HT-LCVD apparatus.

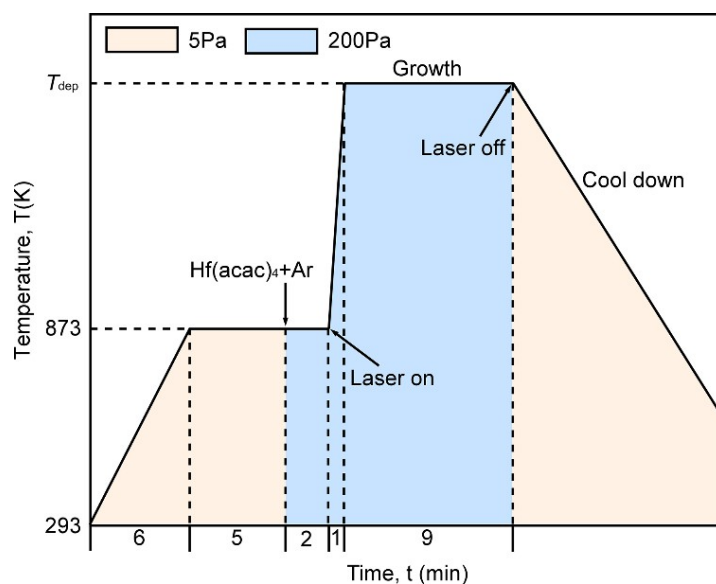


Fig. S2. A diagram showing the evolution of temperature in HfO_2 films grown using HT-LCVD.

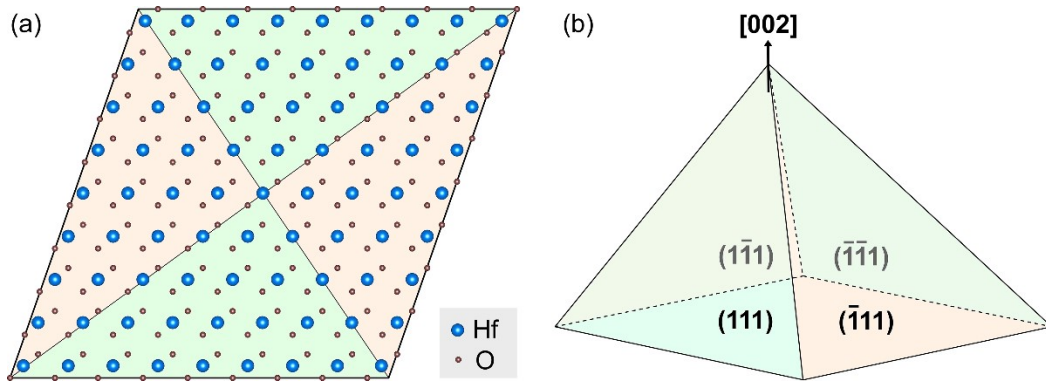


Fig. S3. A schematic model for the growth of $\langle 002 \rangle$ -oriented grains in Region II showing (a) atomic nodes and (b) exposed surface.

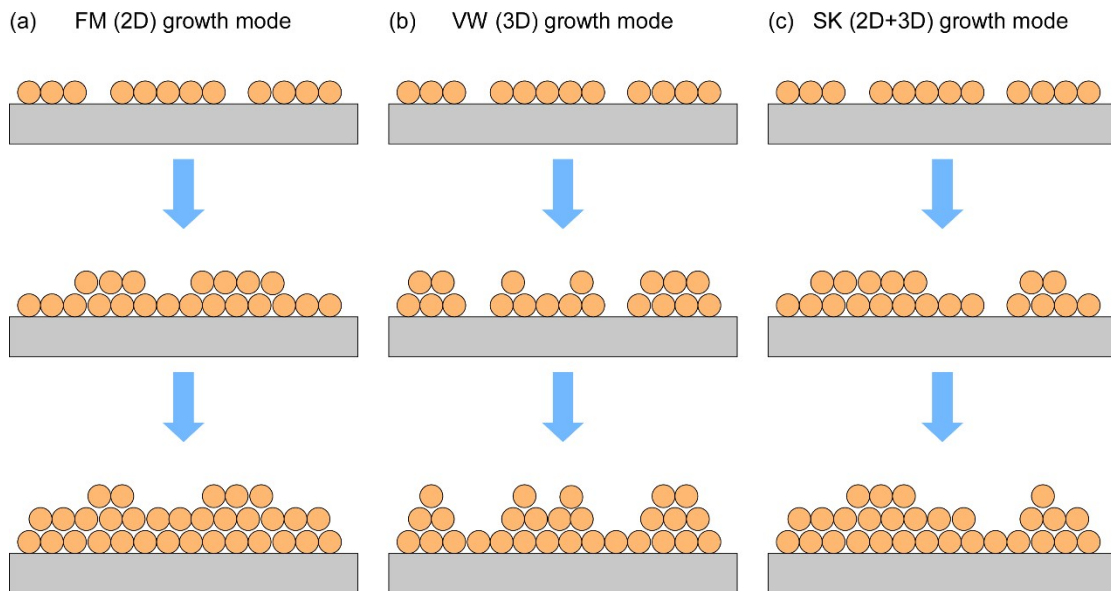


Fig. S4. The schematics of FM, VW, and SK growth models.

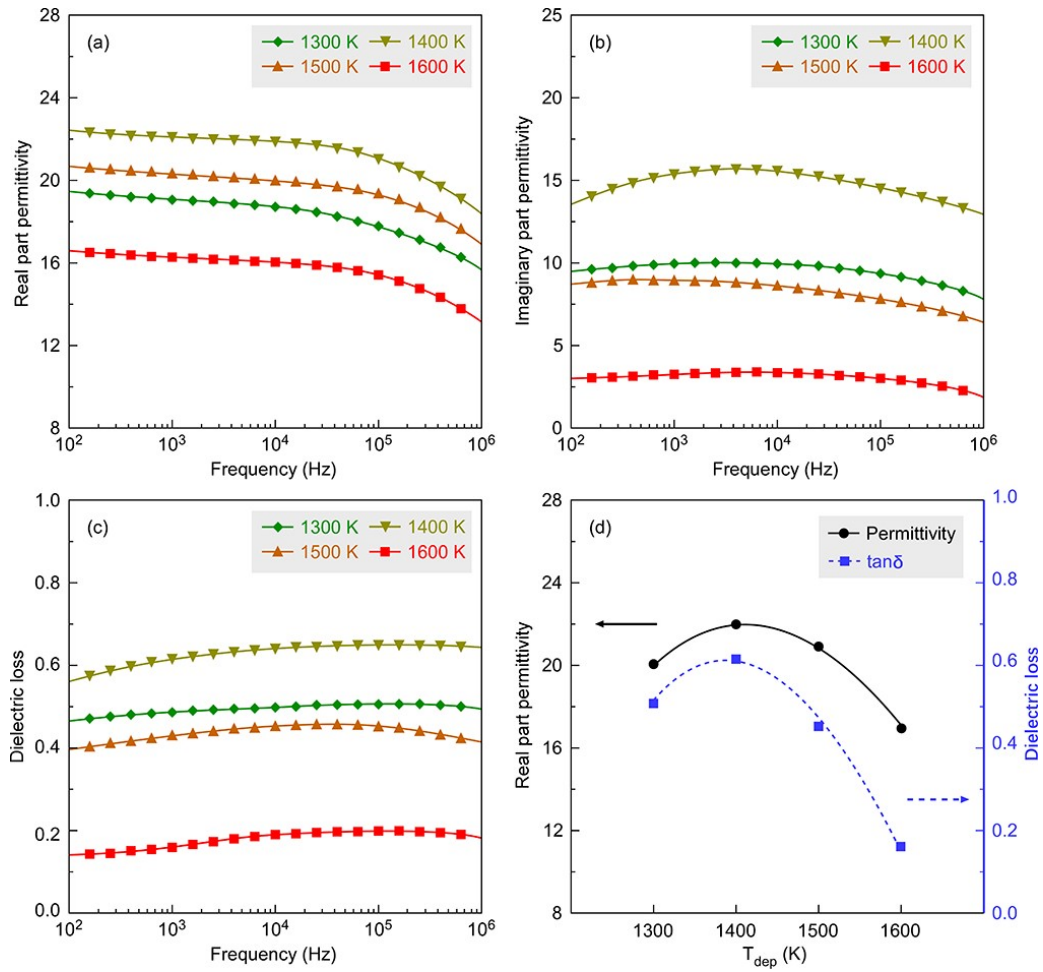


Fig. S5. The dielectric measurements of HfO₂ films in different regions, as the (a) real part permittivity, (b) imaginary part permittivity, (c) dielectric loss ($\tan\delta$), and (d) variation chart of permittivity and dielectric loss.