

# **Influence of anisotropic strain on the dielectric and ferroelectric properties of SrTiO<sub>3</sub> thin films on DyScO<sub>3</sub> substrates**

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**Abstract:** The in-plane dielectric and ferroelectric properties of coherent anisotropically strained SrTiO<sub>3</sub> thin films grown on orthorhombic (101) DyScO<sub>3</sub> substrates were examined as a function of the angle between the applied electric field and the principal directions of the substrate. The dielectric permittivity revealed two distinct maxima as a function of temperature along the [100]<sub>p</sub> and [010]<sub>p</sub> SrTiO<sub>3</sub> pseudocubic directions. These data, in conjunction with optical second-harmonic generation, show that the switchable ferroelectric polarization develops first predominantly along the in-plane axis with the larger tensile strain before developing a polarization component along the perpendicular direction with smaller strain as well, leading to domain twinning at the lower temperature. Finally, weak signatures in the dielectric and second-harmonic generation response were detected at the SrTiO<sub>3</sub> tilt transition close to 165 K. These studies indicate that anisotropic biaxial strain can lead to new ferroelectric domain reorientation transitions that are not observed in isotropically strained films.