Abstract Submitted
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Symmetry, strain, defects, and the nonlinear optical response of crystalline $BaTiO_3$/silicon.[1] KRISTY KORMONDY, The University of Texas at Austin, STEFAN ABEL, YOURI POPOFF, MARILYNE SOUSA, DANIELE CAIMI, HEINZ SIEGWART, CHIARA MARCHIORI, IBM Research – Zurich, Säumerstrasse 4, 8803 Rüschlikon, Switzerland, MARTA ROSSELL, Electron Microscopy Center, Empa, ALEX DEMKOV, The University of Texas at Austin, JEAN FOMPEYRINE, IBM Research – Zurich, Säumerstrasse 4, 8803 Rüschlikon, Switzerland — Recent progress has been made towards exploiting the linear electro-optic or Pockels effect in ferroelectric $BaTiO_3$ (BTO) for novel integrated silicon photonics devices. In such structures, the crystalline symmetry and domain structure of BTO determine which electro-optic tensor elements are accessible under application of an external electric field. For epitaxial thin films of BTO on Si (001), the role of defects in strain relaxation can lead to very different crystalline symmetry even for films of identical thickness. Indeed, through geometric phase analysis of high-resolution scanning transmission electron microscopy images, we map changes of the in-plane and out-of-plane lattice parameters across two 80-nm-thick BTO films. A corresponding 20% difference in the effective electro-optic response was measured by analyzing induced rotation of the polarization of a laser beam (λ = 1550 nm) transmitted through lithographically defined electrodes. Understanding, controlling, and modelling the role of BTO symmetry in nonlinear optics is of fundamental importance for the development of a hybrid BTO/Si photonics platform..

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