

# RECENT ADVANCES IN STRAINED SILICON PHOTONICS

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Silicon-based photonics has generated a strong interest in recent years, mainly for optical communications and optical interconnects in integrated circuits. The main motivations for silicon photonics are the reduction of photonic system costs and the increase of the number of functionalities on the same integrated chip by combining photonics and electronics, along with a strong reduction of power consumption. However, one of the limitations of silicon as an active photonic material is its vanishing second order optical susceptibility, the so called  $\chi(2)$ , due to the centrosymmetry of the silicon crystal. To overcome this limitation, strain ( $\epsilon$ ) has been used as a way to deform the crystal and destroy the centrosymmetry which inhibits  $\chi(2)$ . In this paper, we present recent developments on strained silicon photonics taking into account parasitic effects including plasma dispersion effect and fixed charge effect under an electric field. We have theoretically and experimentally demonstrated electro-optic effect in silicon waveguides strained by a SiN overlayer deposited by PECVD, which could be attributed to a combination of Pockels effect and carrier effect<sup>1</sup>. Recent results on high-speed measurements will also be presented to dissociate Pockels effect and plasma dispersion effect.

## References

1. P. Damas et al., *Phys. Rev. B* **10000**, 93, 16 (2016).