# Subwavelength gratings for sensing and polarization management


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Sub-wavelength grating (SWGs) structures are becoming important building blocks in planar waveguide photonic devices [1]. SWG structures have been successfully applied in the design of a range of devices with remarkable performance by using refractive index engineering and dispersion engineering techniques [2]. In this work we explore two new promising applications of these structures, namely in evanescent field waveguide sensing and polarization management. For the evanescent waveguide sensing devices, we show that sub-wavelength patterning of silicon wires can be used to control the delocalization of the waveguide mode and therefore enhance both bulk and surface sensitivities (Fig. 1). We will also discuss the implementation of subwavelength structures in efficient polarization splitter and rotator (PSR) devices [3]. PSR devices based on asymmetrical directional couplers typically exhibit stringent fabrication tolerances. We show that by implementing SWG structures in PSR design both the effective mode index and its derivatives with respect to critical dimensions can be controlled, which significantly improves tolerance to fabrication errors (Fig. 2).

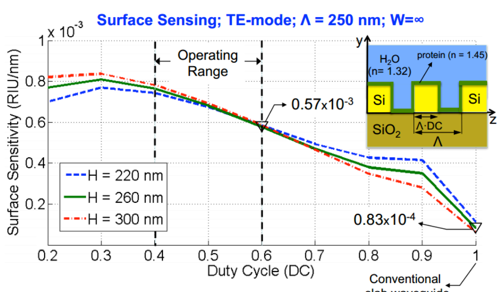


Fig. 1: Surface sensitivity of the slab-type SWG-waveguide as a function of the duty cycle and for different silicon heights.

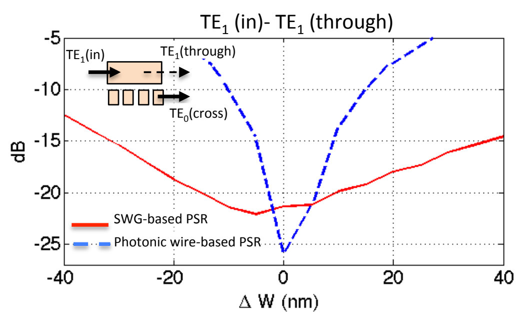


Fig. 2: Extinction Ratio (dB) as a function of waveguide width errors in a SWG-based PSR. $TE_1$(in) is excited by the $TM_0$ mode from a narrower input waveguide.

## References


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