

High-speed Nanophotonic Coupler: A Low-loss Platform for Optical Interconnects

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A nano-scale on-chip photonic coupler with low loss is a promising candidate for optical interconnects. In this work a low-loss and high-speed nanophotonic vertical coupler with ultra-short coupling length based on hybrid plasmonic (HP) waveguide with a lateral sub-wavelength grating (LSG) is proposed. High-speed coupling evident from an ultra-short coupling length of $0.461 \mu\text{m}$ is achieved through the lateral resonances in the sub-wavelength grating. The combined effect of LSG and the metal layer sandwiched between the coupling dielectric-regions makes it possible to realize efficient coupling and low-loss guiding of hybrid modes with a propagation lengths of 123 and $53 \mu\text{m}$, respectively, for odd and even modes. The high-speed vertical coupling influenced by the lateral resonances through LSG also exhibits broadband nature where the coupling length remains acceptably small and the coupling performance remains high over a broad range of wavelengths. The coupling performance of 192 and a low propagation loss of $0.035\text{-dB}/\mu\text{m}$ are reported with the analysis based on finite element method. The fabrication of proposed device is in progress. The proposed HP waveguide based nanophotonic coupler is capable of being integrated with nano-optoelectronic devices on the silicon platform and it can be find applications in optical interconnects.

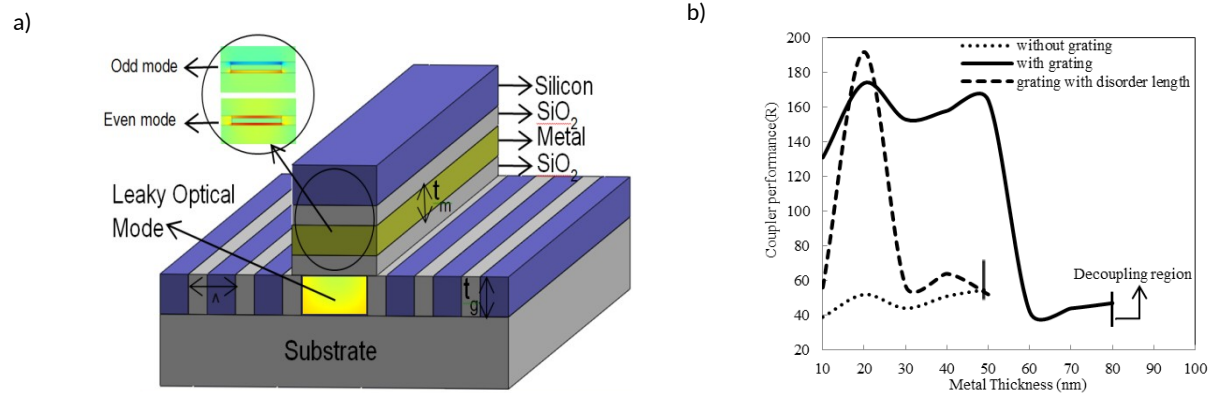


Fig.1 a) Schematic of the proposed design of nanophotonic vertical coupler based on hybrid plasmonic waveguide. The Si/SiO₂ grating is formed on the SiO₂ substrate. b) The variation of the metal thickness with the coupler performance is shown.

For more details: <http://ieeexplore.ieee.org/document/7572212/>