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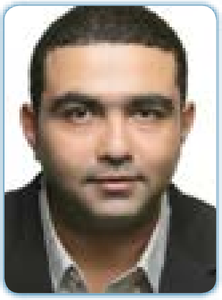

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On-chip plasmonic modulator

Surface plasmon polaritons SPPs are electromagnetic waves generated at the interface between a dielectric and a high electron density material such as metals. The field of manipulating and dealing with such distinguished electromagnetic waves is known as the field of plasmonics. The most significant properties of plasmonics are the ability of confining the electromagnetic energy to beyond the classical diffraction limit, and the enhancement of the electromagnetic fields as for example in the metal-dielectric-metal slot. So, plasmonics offer the miniaturization of photonic components to nano-scales that were not possible to achieve using the conventional silicon photonics platform. Since plasmonic components are in the nano-scale, then, plasmonics which enable the integration of the photonic and electronic components on the same chip since they have comparable sizes. Distinct applications based on plasmonics have been successfully produced and studied such as sensors[1-3], filters, multiplexers, interferometers, and modulators. The modulator is one of the most significant components in telecommunication devices. Since silicon weak nonlinear electro-optic effects, its modulation ability is very poor. However, plasmonics have shown the ability to integrate high nonlinear electro-optic polymers EOPs with plasmonic components to produce high performance plasmonic modulators[4-8]. Such modulators have the advantages of high speed operation and minimized device size. In this paper, we introduce an on-chip plasmonic modulator, which is characterized by its high modulation depth, low power consumption, and small footprint. The modulator is based on the ring resonator mechanism the structure is built from a stack of five layers above a SiO_2 substrate. The layers are built as Si-EOP-metal-EOP-Si. Upon applying a small voltage across the EOP layers, the EOP changes its refractive index, so the plasmonic mode changes its effective index value, this results in a change of the resonant wavelength/frequency in the ring resonator. Fig.1 shows the shift of the resonant wavelength due to an application of voltage of only 1.3V. This wavelength shift can be understood as a change in level of the transmitted power, thereby can be viewed as optical modulation..

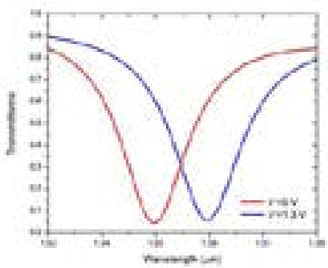

Fig 1. Optical modulation pronounced by the resonant wavelength shift at λ = 1.55μm through voltage application across the EOP.

Biography

M A Swillam is Received his Ph. D from McMaster University, Hamilton, Canada in 2008. After graduation he worked as post-doctoral fellow in the same group. In October 2009, he joined the photonic group and the institute of optical sciences at the University of Toronto where he works as a research fellow. In September 2011, he joined the Department of Physics, the American university in Cairo (AUC). He authored more than 175 technical papers in highly ranked journals and conferences. He also hold 2 patents, a book, and book chapter in these areas. Dr. Swillam is an editor in few international Journals He is also member of the editorial board of many conferences He is also a senior member of the IEEE Photonic society since 2010. He is the founder and the advisor of the optical society of America and SPIE chapters at the AUC and the vice president of the Egyptian Unit.

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