



Technology Commercialization Opportunity

TWG - Tunable Graphene/Epsilon Near Zero (ENZ)-Slot Waveguides

Inventor(s):

Zhaolin Lu, PhD., Rochester Institute of Technology

Wangshi Zhao, Doctoral student, Rochester Institute of Technology

Technology Description:

One of the most important devices in optoelectronic integrated circuits is the electro-optic (EO) modulator, which converts electronic signals into high bit-rate photonic data. Recent years have witnessed breakthroughs in the development of EO modulators. However, the lack of ultrahigh-speed compact EO modulators remains a critical technical bottleneck impeding the wide development of the on-chip optical interconnects. Due to the poor EO properties of regular materials, a conventional EO modulator has a very large footprint.

The present invention overcomes these limitations and provides a solution to remove the technical bottleneck in on-chip optical interconnects. This method involves employing graphene with its unique optical properties, or transparent conductive oxides (TCOs) working as epsilon-near-zero (ENZ) materials, with a novel slot-waveguide structure. Either the graphene or the TCOs is sandwiched inside a dielectric or plasmonic waveguide. The absorption of the graphene-slot or TCO-slot waveguide can be switched between low absorption state and high absorption state (dielectric constant of the graphene or the accumulation layer in TCOs is very small and close to zero) by the gate voltage across the waveguide.

Please refer to Figure 1, below.

Keywords: Modulators, tunable, slot-waveguide, graphene, transparent conductive oxides (TCOs), epsilon-near-zero (ENZ), optical switching, beam steering, optical scanning.

Technology Readiness:

Tunable graphene/ENZ-slot modulator is currently in the concept stage, with some preliminary results in numerical simulations and experiments.

Idea	Concept	Prototype	Alpha Version	Beta Version	Released
------	---------	-----------	---------------	--------------	----------

Intellectual Property (IP):

This technology is the subject of U.S. patent application 20140023321.

Applications:

The invention can be used to improve the bottleneck of the on-chip optical interconnects with the advantages of nanoscale footprints, small insertion loss, low power consumption, and potential ultrahigh-speed, as well as being CMOS-compatible. The applications of the invention is not only limited to EO modulation, but also all-optic modulation, optical detection, etc.

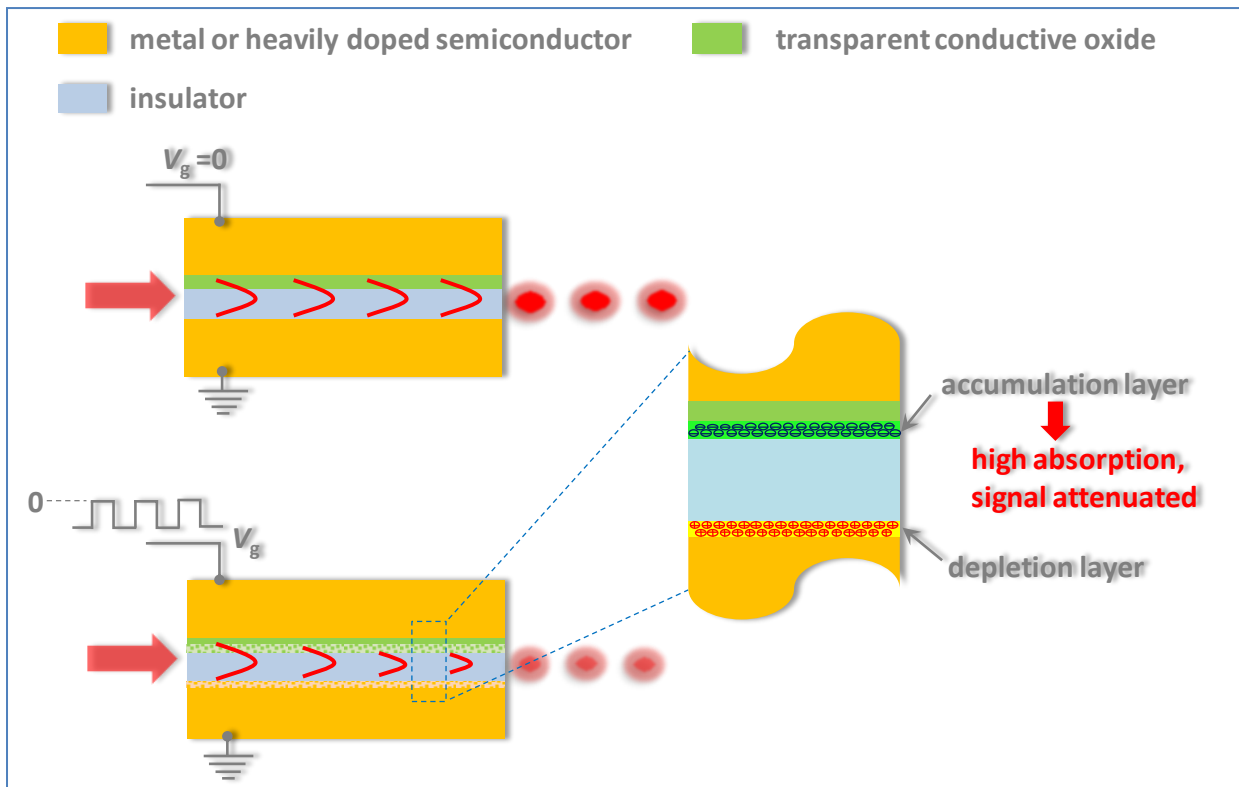


Figure 1 (top) No external voltage, light propagates in the TCOs-slot waveguide without attenuation. (bottom) With a suitable external voltage, light is significantly attenuated in the waveguide.

Target Customers:

Manufacturers of semiconductors, integrated circuits, optical scanners, optical communication systems and optical computing systems

Opportunity:

RIT's Intellectual Property Management Office (IPMO) is interested in working with those parties who are qualified and interested in the commercialization of this electro-optical/photonic IP . Arrangement types include licensing the application to existing organizations or new organizations that have expertise in the field or related fields. The inventors of the technology are available to work with licensees.

Contact:

Those interested in learning more about this opportunity should contact:

Mr. William E. Bond, Director of Intellectual Property Management at RIT (585) 475-2986

bill.bond@rit.edu

Please refer to ID 2011-012 and 2012-003