Graphene electro-optic modulators on silicon nitride waveguides

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1. Abstract

Graphene is an attractive material for optoelectronics due to its broadband absorption and high carrier mobility [1]. With only an atomic layer of material, graphene offers the possibility for extremely fast and broadband electro-optical devices. Two graphene layers separated with a few nanometers-thin dielectric layer create a capacitor, which has been successfully demonstrated for signal modulation of tens of Gb/s [2]. For doped Si-waveguides, it is enough to have one graphene layer since the waveguide can act as a second capacitor plate [3]. Spectral filtering on Si can be obtained by a Bragg grating located along the waveguide [4]. Another spectral filtering approach is based on arrayed waveguide grating [5]. They are of special interest due to their flexibility in parameter choices and the possibility of fabrication with the same step as the waveguide, and no additional space is required on the chip. The interest in silicon nitride as an optical material has increased recently. Especially, Si_3N_4 waveguides feature broadband transparency and low losses compared to conventionally used Si waveguides. This allows silicon nitride to be used in nonlinear and quantum systems. However, the process of graphene transfer or growth on top of silicon nitride can still be improved. This work is devoted to research on nanostructured silicon nitride waveguides (Fig. 1) combined with graphene for electro-optical modulation.

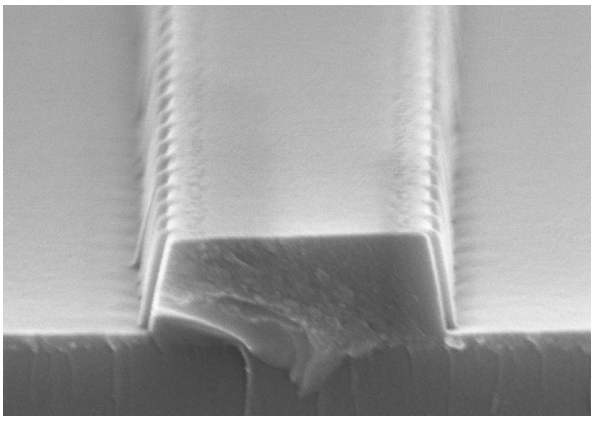

Fig. 1. Cross section SEM image of the nanostructured Si_3N_4 waveguide.

2. Acknowledgement.

Authors acknowledge the support from Business Finland grant #28416, Academy of Finland Flagship PREIN #320166, and MSCA RISE H2020-MSCA-RISE-2016 Project Graphene 3D (Grant Number: 734164).

3. References

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