Optical switching on silicon photonics with phase change materials

Pablo Sanchis
Jorge Parra, Alejandro Santomé, Miguel Ribera, Juan Navarro
Nanophotonics Technology Center – Univ. Politècnica de València, Camino de Vera s/n, Valencia, Spain
pabsanki@ntc.upv.es

The interest in the development of silicon-based photonic integrated circuits (PICs) for a large range of applications is nowadays unquestionable. Silicon PICs benefit from a CMOS compatible fabrication and high index contrast that allows manufacturing at a large scale, low cost, and high density of integration. To enhance and develop new functionalities, the integration of materials, featuring outstanding optical properties, with silicon photonic structures has become an active research field. In this context, phase change materials, such as vanadium dioxide (VO_2) [1] or germanium-antimony-tellurides [2], have been established as effective approaches for optical switching with ultra-compact footprints, broadband operation, low-power consumption and fast speeds. The main benefits and limitations of both technologies will be reviewed in this work. Furthermore, our recent results on all-optical switching employing an ultra-compact VO_2/Si photonic waveguide with switching speeds of around 300 ns will be presented [3].

REFERENCES

[1] S. Cueff, J. John, Z. Zhang, J. Parra, J. Sun, R. Orobtchouk, S. Ramanathan, and P. Sanchis, APL Photonics 5, (2020) 110901.
[2] S. Abdollahramezani, O. Hemmatyar, H. Taghinejad, A. Krasnok, Y. Kiarashinejad, M. Zandehshahvar, A. Alù, and A. Adibi, Nanophotonics 9, (2020) 1189.
[3] J. Parra, T. Ivanova, M. Menghini, P. Homm, J.-P. Locquet, and P. Sanchis, J. Light. Technol. 39, (2021) 2888.

FIGURES

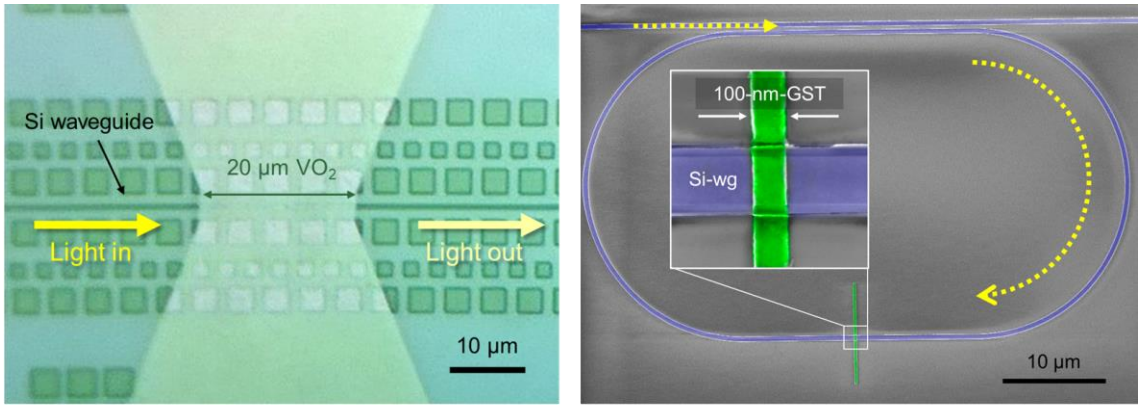

Figure 1: (a) Optical microscope image of VO_2/Si waveguides. (b) False-colored scanning electron microscope (SEM) of a GST/Si waveguide in a ring resonator.

ACKNOWLEDGEMENTS
Financial support from Ministerio de Ciencia e Innovación (PID2019-111460GB-I00, ICTS-2017-28-UPV-9F, TEC2017-90556-REDI, FPU17/04224) and Generalitat Valenciana (PROMETEO/2019/123, IDIFEDER/2018/033) are acknowledged.