Hybrid Graphene-Silicon Photonics Devices for Telecom and Datacom

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Abstract

The exponential growth in data traffic in core, metro and access communication networks, in data centres and for future 5G-applications sets ever more stringent requirements on the photonic devices used in these systems. Densely integrated transceivers with lower power consumption and higher bitrates are urgently requested by the industry. The intrinsically high speed of graphene, its wide transparency, its relatively temperature independent operation and the potentially cheaper integration process are very attractive in this context. Therefore, worldwide, research groups are investigating if graphene-based integrated photonic devices can full-fill the needs of the telecom and datacom industry. Integration of graphene and other 2D-materials with optical waveguides allows to precisely tailor the interaction strength of these 2D-materials with light. Over the past years several groups have used this approach to realize integrated detectors [1][2], modulators and switches. In this talk we will first discuss the relevant applications and their respective requirements. Next we will discuss recent progress in this domain obtained in the context of the Graphene Flagship project. This includes the demonstration of high-speed amplitude modulators [3], their integration with wavelength demultiplexers, the first demonstration of phase modulation [4], high speed detectors [5][6][7][8] and efficient thermal tuning[9]. Integration with both silicon and silicon nitride waveguides is being studied and optimised [10]. Progress towards wafer-scale integration of the relevant processes will also be discussed.

References