Photonic integration: beyond telecom and datacom

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Abstract: In this paper we elaborate on the use of silicon photonic integrated circuits for sensing applications. We will discuss disposable bio-sensing chips, chips for biomedical applications such as optical coherence tomography and laser doppler vibrometry as well as integrated spectroscopic sensors based on Raman spectroscopy and vibrational spectroscopy.

Silicon photonics has emerged as a prominent platform for the realization of high data-rate transceivers for use in optical interconnect and telecommunication applications. Silicon photonics leverages the existing technologies in advanced CMOS fabs, which has resulted in a very fast progress in this field as well as the development of an industrial supply chain. The available high refractive index contrast also allows for unprecedented miniaturization. The market potential for silicon photonics is however much broader than datacom and telecom, and there are especially opportunities in the area of lab-on-a-chip. In this paper we will elaborate on the development of a disposable biosensor platform for the detection of biomolecules, a technology that starts to become commercially available. Current research efforts focus on the realization of spectroscopic sensor systems, both in the near-infrared (Raman spectroscopy using SiN waveguide technology) and the mid-infrared (vibrational spectroscopy using Si/Ge technology), in order to enhance the selectivity of currently available sensors. Also in the biomedical field silicon photonic integrated circuits for e.g. optical coherence tomography and laser doppler vibrometry are of interest.