

Broadband mid infrared Ge-rich SiGe waveguides and Mach-Zehnder interferometric devices: design, fabrication and characterization

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The extension of silicon photonics towards the mid infrared (mid-IR) spectral range has recently attracted a lot of attention. The development of photonic devices operating at these wavelengths is crucial for many applications including environmental and chemical sensing, astronomy and medicine.

Recent works regarding the development of Ge-rich SiGe waveguides and interferometric devices on silicon will be presented. In particular, low-loss waveguides with good butt-coupling performance over a wide range of mid-IR wavelengths (from 5.5 μm up to 8.5 μm) will be shown, hence providing a key building block for further development of mid-infrared photonic integrated circuits. Specifically the design, fabrication and characterization of ultra-wideband couplers, resonators, and Mach Zehnder interferometers will be disclosed. These results provide a solid basis to develop a competitive mid-IR integrated platform which could potentially exploit the complete Ge transparency window, up to $\lambda \approx 15 \mu\text{m}$.