S2-I2

Above 100Gb/s by Wafer-bonding Hybrid Si Photonics integration

(invited talk)

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Silicon photonics has been treated as one of the key technologies for various emerging applications, such as high-speed data interconnects, data communication, and remote sensor. Through defining the submicron optical waveguide, dense active and passive optical elements can be integrated for different functions through so-called CMOS compatible processing technologies, enabling high-speed optical interconnect, optical communication, and remote sensors. However, two major technology bottlenecks will be formed due to the intrinsic material issues: one is the indirect bandgap of Si-related material and the other is the optical coupling between different material system, which not only restricts the functions of light generation and amplification but also leading to complex fabrication processing in integrating devices.

Thin-film integration using different layer structure of material then becomes one promising solution to enhance the future function in photonic integration. As shown in Fig.1, by integrating layer-by-layer structure through different material system, the coupling between layers is defined by fabricating optical spot size converter (SSC), where wafer bonding was used for connecting two thin-film materials. With such fabrication, the optical active functions, such as gain and light source, could be brought into a Si-based photonic template [1-2]. As a result, the advantages of different material system can be independently taken for performing different functions. In our work, the etching selectivity between materials can be used for self-alignment in vertical processing, enabling 3D photonic integration with just a few simple fabrication steps. Furthermore, hybrid thin-film integration with compact and high-confinement active region, allowing device performance to be built up in a submicron dimension of waveguide. High-speed optical modulation of above 100Gb/s, 10dB/V modulation efficiency, and 8dB optical gain have been demonstrated in such hybrid photonic integration template. High-speed high-power performance with efficiency has also been shown in our recent work. Also, the integration between such chips or material will be proposed with the recent progress for some gyroscope sensor and broadband optical data transmission.

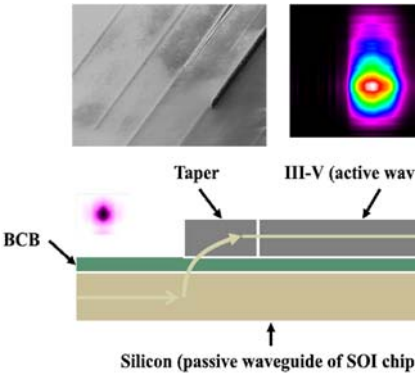

Fig. 1 The schematic diagram of vertically layer-stacked optical spot-size converter (SSC) for Si photonic integration.

REFERENCES

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