Hybrid single mode lasers fabricated using Si/SiO2/SiON micromachined platform.

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Abstract:

While simple Fabri-Perot (F-P) semiconductor lasers are readily available on the market, single mode lasers are produced only in limited spectral intervals, mainly of interest to optical communications. We have devised a hybridization scheme that, given suitable F-P gain medium, allows us to fabricate small, mechanically robust single frequency lasers in a wide spectral range, limited only by the transparency of the SiON material. The technology is attractive for satisfying the needs of specialty applications such as interferometric metrology or gas detection that may require operation outside typical communication wavelengths. Other possible applications include integrated optical sensors and tunable lasers. The device is essentially a distributed Bragg reflector (DBR) laser with the external Bragg grating defined in SiON waveguide deposited on the micromachined silicon bench. A number of recent reports dealt with the coupling of lasers to a planar lightguide circuit (PLC). These PLCs utilize $6\times6$ $\mu m^2$ silica waveguides and require lasers with spot size converters for the efficient coupling of light. In contrast, we utilize SiON waveguides matched to the simple cleaved F-P devices without spot size converters. The technology is within the scope of a typical silicon fabrication facility. We will discuss the fabrication technique and the latest measurement results.