

Membrane III-V phonic devices on SiO₂/Si substrate

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ABSTRACT

We have developed membrane Distributed Reflector (DR) lasers and photonic crystal (PhC) lasers on SiO₂/Si substrate for datacom and computercom applications. We employ direct bonding and regrowth techniques to fabricate buried heterostructure on SiO₂/Si substrate. The increase of optical confinement factor is essential to achieve low operating energy.

We fabricated 8-ch DR laser array and each laser was directly modulated by 50-Gbit/s PAM-4 signal. An SiN arrayed waveguide grating (AWG) filter was used to multiplex output signals from 8-channel DR laser array. The PhC laser with 2.5-μm long active region exhibited a threshold current of 22 μA and modulated a 10-Gbit/s NRZ signal with 7-fJ/bit operating energy. These results indicate that the membrane lasers on SiO₂/Si substrate are highly suitable for use as a transmitter in datacom and computercom applications.