Sb-based Mid-Wave Infrared Laser Arrays

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Mid-wave infrared lasers have advanced in both spectral coverage and power level in the past decade. Particularly, Sb-based semiconductor laser structures are of interests for many applications such as remote sensing, direct diode pump sources, and defense countermeasures. Here we report high power diode laser arrays using these laser structures. The laser structures as shown in Fig 1. were grown using molecular beam epitaxy on GaSb substrates with designed emission wavelengths of 2.0µm, 2.4µm, and 2.7µm. All structures share the same lattice-matched AlGaAsSb quaternary cladding doped with Te for n-type and Be for p-type clad layers. The waveguide consists of lattice-matched quaternary or quinary alloy and compressively strained InGaAsSb quantum wells laced at the center with inter-well spacings. Changing in wavelength is controlled by adjusting In content in the waveguide. Single and four-bar stack arrays were processed, fabricated, and packaged with water-cooled microchannel coolers. Some of the laser performance results tested in various conditions are shown in Fig 2.

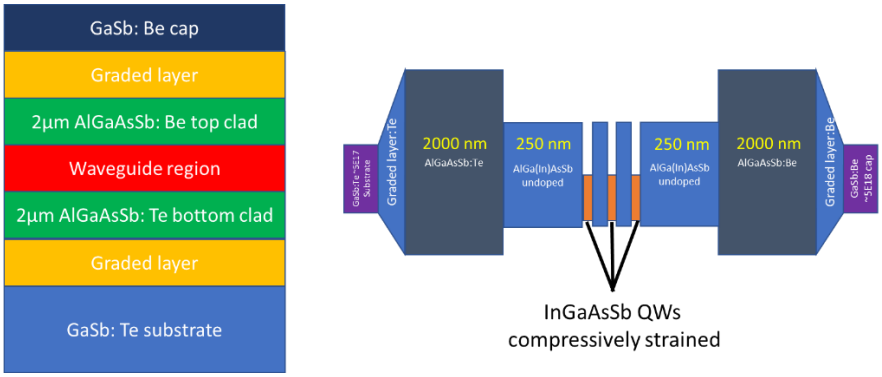

Figure 1 Laser Structure.

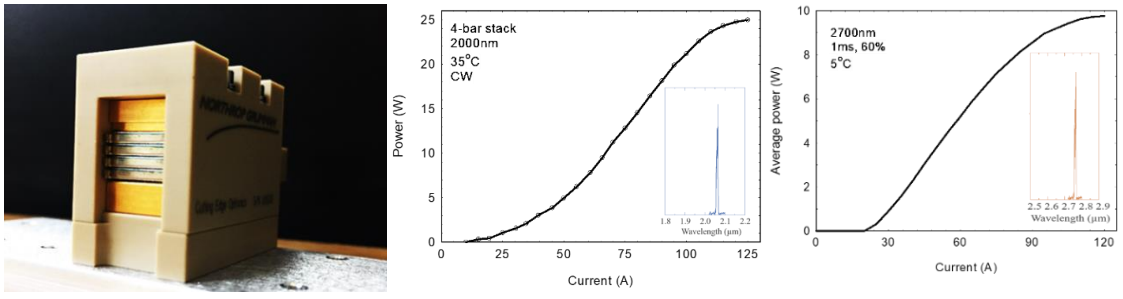

Figure 2 Packaged four-bar stack arrays (left). 2.0µm continuous-wave (CW) operation (middle). 2.7µm 60% duty cycle quasi-CW operation (right).

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