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Dual-Wavelength Twin-Stripe Laser Using Single Quantum Well Structure

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We present a new approach to fabricate a dual-wavelength laser by using a single quantum well (SQW) structure.

The epitaxial layer configuration of the present laser is a graded-index waveguide separate-confinement heterostructure (GRIN-SCH), grown on an n-type (100) oriented GaAs substrate by molecular beam epitaxy (MBE). The active layer is a 100-Å-thick GaAs SQW, while AlAs-GaAs graded-index superlattices (SL's) were used as optical confinement layers.[1] A twin-stripe buried heterostructure (BH) laser was fabricated by utilizing Zn impurity-induced-disordering,[2] as shown in Fig. 1. We intentionally make the difference in width between the two emitters E_1 and E_2 (about 6 and 3 μm).

For cavity lengths of about 500 μm, the two emitters E_1 and E_2 in the device lased at two considerably different wavelengths. Typical emission spectra of the dual-wavelength laser are shown in Fig. 2. The lasing wavelength difference is as wide as 30 nm.

Our recent investigation on similar BH SQW lasers[3] demonstrated that for the narrower waveguide width, the gain available at the n=2 quantized state transition contributes to lasing in the longer cavity. Lasing behavior such as in Fig. 1, therefore, is interpreted in terms of the n=1 and n=2 quantized state lasings, which should result from the difference in the internal optical loss between the wider and narrower cavities.

The applications of the result are useful for light sources in future optical communication systems, as well as optical information processing systems.

References

1) Y. Tokuda et al.: J. Appl. Phys. 60 (1986) 2729.
2) K. Meehan et al.: Appl. Phys. Lett. **44** (1984) 700.
3) Y. Tokuda et al.: Appl. Phys. Lett. 49 (1986) 1629.

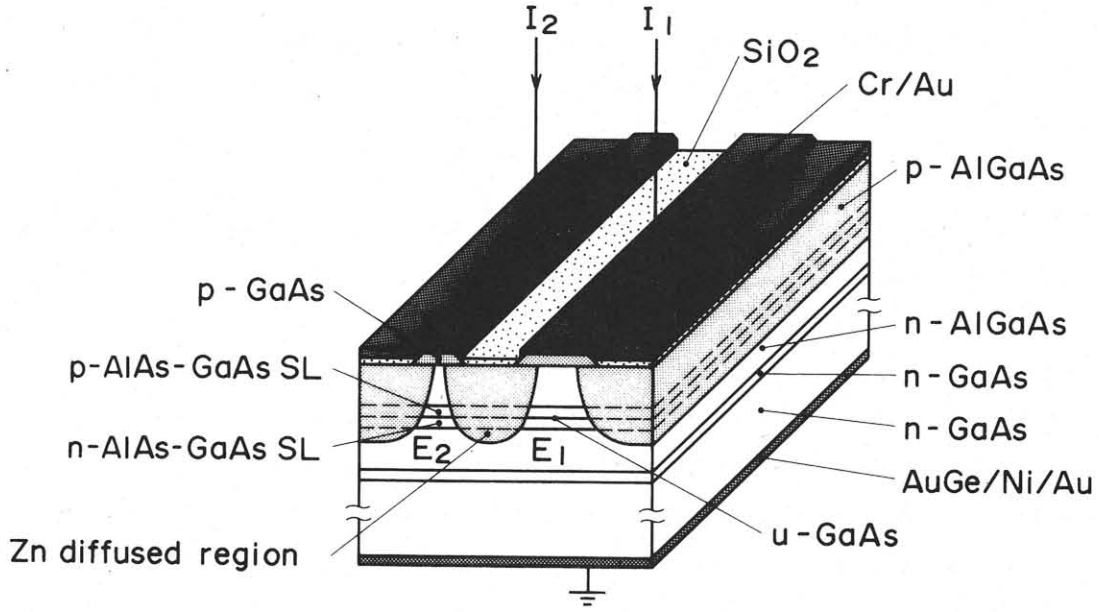

Fig. 1 Schematic illustration of a twin-stripe laser.

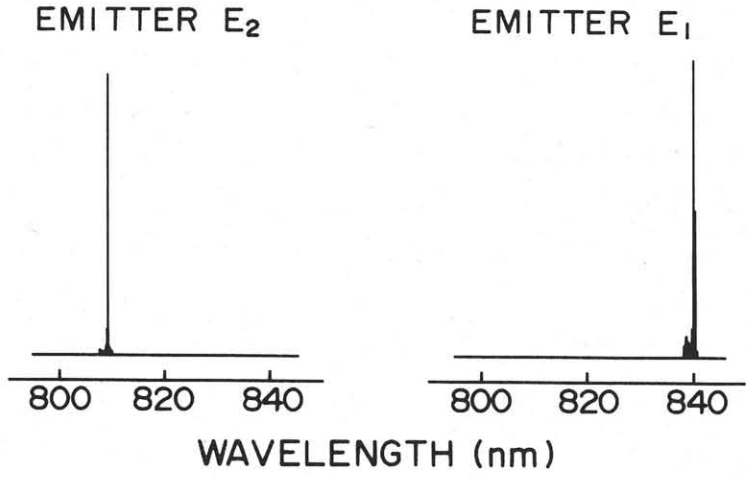

Fig. 2 Typical lasing spectra of a dual-wavelength laser.