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Al-FREE SEMICONDUCTOR LASER HAS GREATER POWER, LIFETIME

Semiconductor lasers ordinarily contain aluminum, as in AlGaAs/GaAs structures. The aluminum itself is prone to oxidation and causes sudden and catastrophic failure in the devices, limiting their application severely. The great race to fabricate semiconductor lasers without aluminum now appears won by scientists at the Center for Quantum Devices at Northwestern University.

Aluminum-based lasers suffer from defects known as dark lines or dark spots. By absorbing light, the defects cause overheating of the mirror facets and local melting of the crystal. The Northwestern scientists made their lasers using MOCVD and gas molecular beam epitaxy in various combinations of materials, GaInAs/GaAs and GaInP/GaAs, the most common. The materials tolerate defects without sudden failure, and show low surface resistance, which is important for high power applications.

The performance of the lasers is surprising. The developers took unpackaged, uncoated aluminum-free lasers, and ran them at 60 degrees C for 30,000 hours (roughly 3.5 years). The devices showed no failure or degradation in performance, and no change in wavelength, threshold or output power. Compare that with conventional lasers containing aluminum, which would fail within 10 hours under the same conditions. Light emitted from the new lasers shows a beam divergence of 26 degrees, compared with 50 degrees for a conventional laser. The greater confinement reduces pumping requirements and boosts power. Lab tests demonstrate 8 W of pulse operation, and 6 W in continuous wave operation, the best values ever reported for infrared wavelengths.

Northwestern University has granted an exclusive license to Semiconductor Laser International Corp. of Endicott, NY, to manufacture, market and sell the aluminum-free lasers. Applications are expected to cover telecommunications, medicine, the military, precision machining and many other areas. The lasers will be on the market by Summer 1997.

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