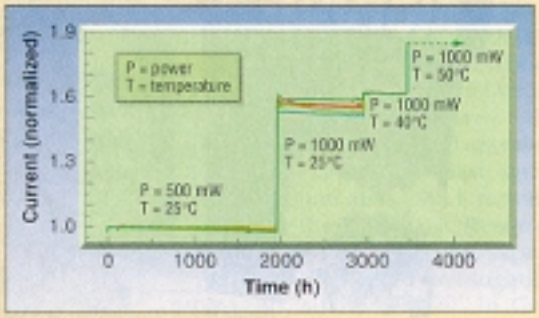
Laser Focus World

WORLD NEWS

SEMICONDUCTOR LASERS

Aluminum-free diode lasers last longer



Ongoing tests suggest both rugged operation and long life for indium gallium arsenide phosphide (InGaAsP) based aluminum-free diode lasers fabricated by researchers at Northwestern University (Evanston, IL). Elimination of aluminum removes an easily oxidized specie that spreads performance-degrading defects through the structure by forming light-absorbing dark lines or spots (see *Laser Focus World*, Aug. 1994, p. 26).

In a previous reliability test, a single diode operating at 400 mW of output power at 40°C did not exhibit any degradation after more than 3000 h. The current test regimen involves six randomly selected InGaAsP/GaAs 808-nm diode lasers and has reached the 6000-h mark with "no change in wavelength, power or current," says Manijeh Razeghi, director of the Center for Quantum Devices at Northwestern. The tests started with the diodes at powers of 500 mW and 25°C with step-increases in power and temperature to current levels of 1000 mW at 50°C (see figure). Razeghi says diode lifetimes are currently extrapolated to be 400 to 500 years and adds that long-lived high-power 808-nm diode lasers would be useful for pumping Nd:YAG lasers efficiently—these diode pumps would then be as reliable as the solid-state laser itself.

The testing is done on diode lasers with uncoated facets. Aluminum gallium arsenide (AlGaAs) based diodes often have coated facets to decrease absorption and raise the catastrophic optical damage (COD) limit. The coating procedure can itself, however, introduce degradation and increases production costs. With uncoated facets, the aluminum-free structures have a 6-MW/cm^2 COD, while that for uncoated AlGaAs diodes ranges from 0.5 to 1 MW/cm^2.

Rick DeMeis