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HIGH-POWERED LASER ON A CHIP: Look for a new generation of miniature lasers. Researchers at Northwestern University have discovered a way to make high-powered lasers on a computer chip. Previously, the only way to make such lasers, used in medicine, information storage, high-definition television and a number of military applications, had been either to construct the familiar long gas chambers or make computer chips that contain aluminum. Trouble with the aluminum-based chips is that they have very short lives and can be used only in limited applications. The aluminum content has led to defects in the original construction and sudden failures in operation.

Tests on bench versions of the new lasers show them to be more reliable and stable than the best results ever reported for the aluminum-based chips. The lasers should also be simple to produce, easy to operate, and provide a power density one order of magnitude greater than currently available. Remaining prototype problems should be solved and the concept ready for commercial development in six months. Don't be surprised to see a commercial product as soon as two to three years. Patents have been applied for.

New chips do their lasing in aluminum-free quantum wells made with indium gallium arsenic phosphide. The chips are produced under pressure in the MOCVD (metalorganic chemical vapor deposition) process. The GaInAs/GaInP/GaAs single quantum well laser emits at a wavelength of 980 nm. Threshold current density as low as 80 A/cm^2 and differential quantum efficiency as high as 0.85 W/A have been observed for 1-mm-long coated lasers in the lab. At 50° C and 1-W output, device lifetime has exceeded 1400 hours. Degradation was less than 20%.

The single quantum well separate confinement heterostructure (SQW-SCH) lasers were grown with a 0.04 μm-thick n$^+$-GaAs waveguide layer, 40-Å-thick undoped GaInAs quantum well active layer, 500-Å-thick undoped GaAs waveguide layer, 0.8-μm-thick p-InGaP cladding layer, and 0.2-μm-thick p$^+$-GaAs layer. The wafers were processed into 200-μm broad area lasers with a cavity length of 1-mm by standard photolithography.

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