DIODE-BAR-PUMPED PLANAR WAVEGUIDE LASERS: DOUBLE-CLAD STRUCTURES AND PROXIMITY COUPLING

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Summary
The emission aperture of high-average-power diode-bars is inherently compatible with the geometry of thin-film waveguides. This, together with the power-handling capability of thin slabs, has lead to the possibility of very compact, high-power planar waveguide lasers\textsuperscript{1,2}. Here we report on novel waveguide structures and coupling techniques used to realise such devices in both Nd\textsuperscript{3+} and Yb\textsuperscript{3+} doped YAG.

The guides are side-pumped by simply proximity coupling a diode-bar to the waveguide. Very efficient coupling, for waveguides with core-sizes down to 8\textmu{}m, is achieved through the use of the high-numerical aperture, YAG on Sapphire, guides fabricated by direct bonding\textsuperscript{2}.

The main drawback for simple, monolithic lasers made in this way is the poor output mode quality. Here we will present the first results on diode-pumping of double-clad planar guides such as the one shown aside. Multi-watt, single-guided mode outputs are obtained with both Nd\textsuperscript{3+} and Yb\textsuperscript{3+} doped YAG. The high core to cladding size ratio, imposed by the need to keep the effective absorption length small, leads to a new regime of operation where the spatial mode selection is due to the doping profile rather than the refractive index profile. Control of the output mode in the non-guided plane will also be discussed.


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