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

T. Bhutta, C.L. Bonner, D.P. Shepherd*, and A.C. Tropper
Optoelectronics Research Centre
University of Southampton, U.K.
*email dps@orc.soton.ac.uk

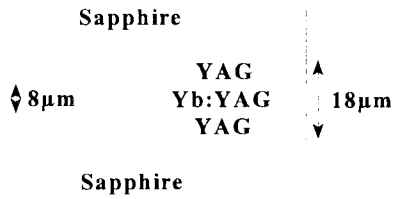
H.E. Meissner
Maxios Laser Corporation
6551 Sierra Lane, Dublin, California 94568, USA

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[1,2]. Here we report on novel waveguide structures and coupling techniques used to realise such devices in both Nd^{3+} and Yb^{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 8μm, is achieved through the use of the high-numerical aperture, YAG on Sapphire, guides fabricated by direct bonding[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^{3+} and Yb^{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.



1. C.L.Bonner, C.T.A.Brown, D.P.Shepherd, W.A.Clarkson, A.C.Tropper, D.C.Hanna, and B.Ferrand, "A Diode-Bar End-Pumped, High Power, Nd:$Y_3Al_5O_{12}$ Planar Waveguide Laser," Opt. Lett., vol.23, pp. 942-944, 1998.

2. D.P.Shepherd, C.L.Bonner, C.T.A.Brown, W.A.Clarkson, A.C.Tropper, D.C.Hanna, and H.E.Meissner, "High-Numerical-Aperture, Contact-Bonded, Planar Waveguides for Diode-Bar-Pumped Lasers," Opt. Comm., vol 160, pp. 47-50, 1999.

The authors wish to acknowledge Raymond J. Beach for useful discussions. The ORC is an EPSRC (UK) interdisciplinary research centre