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Epitaxial waveguide laser of aluminium garnet

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Since few years in the LETI, we studied the growth by Liquid Phase Epitaxy of YAG single crystal layers [1]. In collaboration with the University of Southampton, we investigated the properties of such layers for waveguide laser applications [2,3,4]. The advantages of LPE technique are the easy control of the layer thickness between 1 and 100 μm , the large choice of dopants and concentrations (Nd, Yb, Er, Tm, Ho... in YAG) and the possibility to obtain a higher doping level than in bulk crystals (Nd in YAG for example). In order to realize a waveguide, the refractive index can be adjusted by substitution of others cations like Ga. The properties of the waveguide are optimized by the growth, again by LPE, of an undoped YAG cladding layer.

The main interests of such a waveguide in laser applications are a better matching of the pump and emitted beams, a possible transversal guiding of the pump beam, a low threshold, and the possibility of a selection of the fundamental mode by the thickness control. A diode pumped epitaxial waveguide laser seems to be interesting for eye-safe, high power or up-conversion laser applications.

In this paper, we present laser performances of doped YAG waveguides in respect with the growth procedure and the waveguides preparation. The good quality of the waveguides (losses < 0.1 dB/cm) and the significant laser results obtained, namely for ytterbium doped YAG (low threshold: 40 mW absorbed and large slope efficiency: 80 %), confirm the potential interest of such devices.

- [1] B. Ferrand, D. Pelenc, I. Chartier, C. Wyon, Journal of Crystal Growth 128, 966 (1993).
- [2] I. Chartier, B. Ferrand, D. Pelenc, S.J. Field, D.C. Hanna, A.C. Large, D.P. Shepherd, A.C. Tropper, Optics Letters, Vol 17, 229, (1992).
- [3] D.C. Hanna, A.C. Large, D.P. Shepherd, A.C. Tropper, I. Chartier, B. Ferrand, D. Pelenc, OSA Topical Meeting ASSL, New Orleans, paper JWD-4, Feb 1993.
- [4] D. Pelenc, B. Chambaz, I. Chartier, B. Ferrand, D.C. Hanna, A.C. Large, D.P. Shepherd, A.C. Tropper, ECIO 93 Conference, Neuchatel, paper 3-8, April 1993.