RECENT ADVANCES OF ERBIUM-DOPED LITHIUM NIOBATE WAVEGUIDE LASERS

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The recent advances in the field of Ti:Er:$LiNbO_3$ waveguide lasers are reported. In particular, lasers with grating resonators, acoustooptically tuneable Fabry Perot type lasers and ring lasers are presented.

Erbium diffusion doping of $LiNbO_3$ (e.g. 30 nm / 1130 °C / 150 hrs) is used to fabricate an excellent laser material with Er-concentration levels up to $2*10^{20}$ cm^{-3}. Afterwards, single mode channel waveguides are defined by the standard indiffusion technique of Ti-stripes. By optical pumping at λ = 1480 nm a wavelenth dependent gain of up to 2 dB/cm is achieved (1530 nm < λ < 1610 nm).

Different types of narrow linewidth Distributed Bragg Reflector (DBR-) and Distributed FeedBack (DFB-) lasers are reported. They have photorefractive grating resonators holographically defined in Ti/Fe- and in Ti/Fe/Er-codoped waveguide sections. Single frequency emission at many wavelengths within the Er-gain band (1530 nm < λ < 1603 nm) and an output power of up to 8 mW have been achieved.

The range for continuous tuning of acoustooptically tunable lasers could be extended to 47 nm (1530 nm < λ < 1577 nm). The emission linewidth has been reduced to 12 pm. Moreover, a tuneable frequency shifted feedback laser with adjustable coherence properties has been developed. As one application optical frequency domain ranging is presented with a resolution better than 1 mm.

The concept of ring lasers in Er:$LiNbO_3$ is introduced with their potential to be used as optical gyro. The threshold pump power of the first devices is around 17.5 mW (λ = 1480 nm) coupled to the ring of 60 mm diameter. Clockwise and counter-clockwise lasing at λ = 1603 nm has been achieved with an output power up to 300 μW.

Keywords: integrated optics, Lithium Niobate, Erbium, waveguide laser, optical gyro.

Biography:

Wolfgang Sohler received the Diplom-Physiker and Dr.rer.nat. degrees in physics from the University of Munich, Germany, in 1970 and 1974, respectively. Since 1982 he has been with the University of Paderborn, Germany, as Professor of Applied Physics. His research interests include integrated optics, fiber optics and laser physics. He is a member of IEEE-LEOS, DPG and DGaO.