

Buried channel waveguides in Yb-doped KYW crystals fabricated by femtosecond-irradiation

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Nonlinear absorption of femtosecond laser pulses has been employed in order to induce refractive-index changes in Yb-doped $KY(WO_4)_2$ crystals (KYW). The irradiation damage induced in the doped crystals destroys the lattice order, resulting in a decreased refractive-index region compared to the surrounding bulk material, where no waveguiding can occur. However, light can be well confined between pairs of damaged regions, creating buried channel waveguides where light can propagate in the pristine Yb:KYW crystal. We have demonstrated passive and active buried channel waveguiding between pairs of such barriers separated by 15 microns distance using amplified Ti:sapphire pulses of 200 fs duration and energies in the micro-Joule range. The propagation-loss values measured at several values around 980 nm pump wavelengths remained below 2 dB/cm. Yb-doped double tungstates are recognized as very promising materials for solid-state lasers due to their favorable spectroscopic and laser characteristics. Femto-second writing provides the possibility of implementing three-dimensional (3D) optical integrated circuits in such crystals.

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