

## Femtosecond-irradiation-induced refractive-index changes and channel waveguiding in bulk $\text{Ti}^{3+}$ : Sapphire

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We have employed femtosecond laser writing in order to induce refractive-index changes and waveguides in  $\text{Ti}^{3+}$ -doped sapphire. Doping the sapphire crystal with an appropriate ion significantly reduces the threshold for creating structural changes, thus enabling the writing of waveguide structures. Passive and active buried channel waveguiding is demonstrated and images of the guided modes, propagation-loss values, fluorescence spectra, and output efficiencies are presented. The guiding area is located around the laser-damaged region, indicating that the guiding effect is stress induced. Refractive-index changes are measured by digital holography. Proper active doping should enable femtosecond processing and waveguide writing in various crystalline materials. © 2004 American Institute of Physics. [DOI: 10.1063/1.1781737]