Characterization of the Nonlinear Refractive Index in Phosphate Glasses with Ta_2O_5

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Due to properties such as: high coefficient of thermal expansion, low softening temperatures and low liquid viscosity, phosphate matrix glasses have become interesting materials for optical applications [1]. In addition, several studies in the literature reveal significant changes in the linear and nonlinear optical responses of this matrix due to the incorporation of oxides with transition metals – WO_3, PbO, Nb_2O_5 [2,4]. In this sense, the present work seeks to analyze the influence of the insertion of Ta_2O_5 on the linear and nonlinear optical response of phosphate glasses. The nonlinear refractive index was measured spectrally using the Nonlinear Ellipse Rotation (NER) method [5] with 150-fs pulses at a repetition rate of 750 Hz from a Yb:KGW laser system, which, coupled with an optical parametric amplifier (OPA), allows tuning the wavelength from visible to infrared. The nonlinear refractive index of the samples was referenced against that of silica, with values varying from 2 to 5 times that of silica as the tantalum concentration increased. The values remained practically constant in the infrared, however, in the visible range, there is an enhancement of the nonlinear refractive index attributed to two-photon absorption, as this phenomenon has also been observed in this range.

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