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Proprietà Ottiche Nonlineari e Fotorifrattive del Niobato di Litio Drogato con Afnio

(Nonlinear and photorefractive optical properties of Hafnium-doped Lithium Niobate)

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Lithium niobate is a very interesting material for the realization of nonlinear optical devices because of a combination of several properties and well established technology for fabricating channel waveguides and periodically poled structures. Several authors have shown that wavelength converters based on Periodical Poled Lithium Niobate (PPLN) waveguides can be very efficient and may have important applications, but, at present, a strong limitation to the applications based on ferroelectric crystals comes from the fact that, under illumination with visible or near-infrared light, there are semi-permanent changes in the index of refraction of the crystal, causing beam distortion and dramatically decreasing the device efficiency. Such an effect is called *photorefractive effect*. In order to solve this problem, one possibility studied by our group is that of doping crystal by small percentage of Hafnium (Hf)[1]. Several properties of this new crystals have been studied in our laboratory, such photorefraction, birifrangence and nonlinearity[2,4]. The aim of such an wide range studies is not only to characterize the material, but also to understand the micro-physical mechanisms which determine its optical properties. By experiments we found that the photorefractive effect is strongly reduced in presence of Hf in concentration above 2.5 mol% and that, up to this value of concentration, the efficiency of nonlinear processes is not affected by the dopant insertion. Combining these results with those already present in literature, Hf:LN crystals appear to be very promising candidates for applications[3]. We are now investigating, both by experiments and simulations, the photorefractive behavior of Hf:LN at near infrared wavelength and the electrical field inside crystal structure.

References.

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