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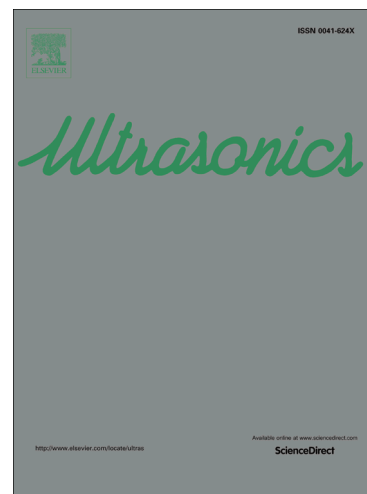
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Specific directions of ultrasound propagation in double potassium tungstates for light modulation

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Abstract

Acousto-optical characteristics of double potassium tungstates are analyzed and specific directions for light modulation are found. First, an important subgroup of elasto-optic coefficients of $\text{KYb}(\text{WO}_4)_2$ and $\text{KLu}(\text{WO}_4)_2$ crystals are calculated with use of experimental data. It is revealed that with proper choice of ultrasound direction the acousto-optical figure-of-merit approximately 2 times exceeds the maximum value detected in previous experiments. Another unique direction is determined, which permits modulation of randomly polarized light. The elasto-optic characteristics of $\text{KYb}(\text{WO}_4)_2$ and $\text{KLu}(\text{WO}_4)_2$ crystals are compared to those of previously investigated materials of the same crystal group: $\text{KY}(\text{WO}_4)_2$, $\text{KGd}(\text{WO}_4)_2$.

Keywords: acousto-optical modulator, elasto-optic matrix, KYW, KGW, KYbW, KLuW.

Introduction

Material processing technologies require acousto-optical (AO) modulators and deflectors capable to withstand high power laser beams. Previously, we demonstrated experimentally [1] that double metal-potassium tungstates $\text{KY}(\text{WO}_4)_2$, $\text{KGd}(\text{WO}_4)_2$, $\text{KYb}(\text{WO}_4)_2$ and $\text{KLu}(\text{WO}_4)_2$ (hereafter abbreviated as KYW, KGW, KYbW, KLuW) possess rather good acousto-optic characteristics in addition to lasing properties. Therefore, power-resistant and effective AO devices can be made of those crystals, for example, AO modulators [2].

However, AO figure-of-merit (FOM) values M_2 (hereafter denoted by M , for simplicity) were measured only for some crystal axes, and so they can be used just as estimation for AO characteristics of the materials. To develop an AO device with the highest characteristics one

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