Researchers propose new method for accurate measurement of electro-optic coefficient

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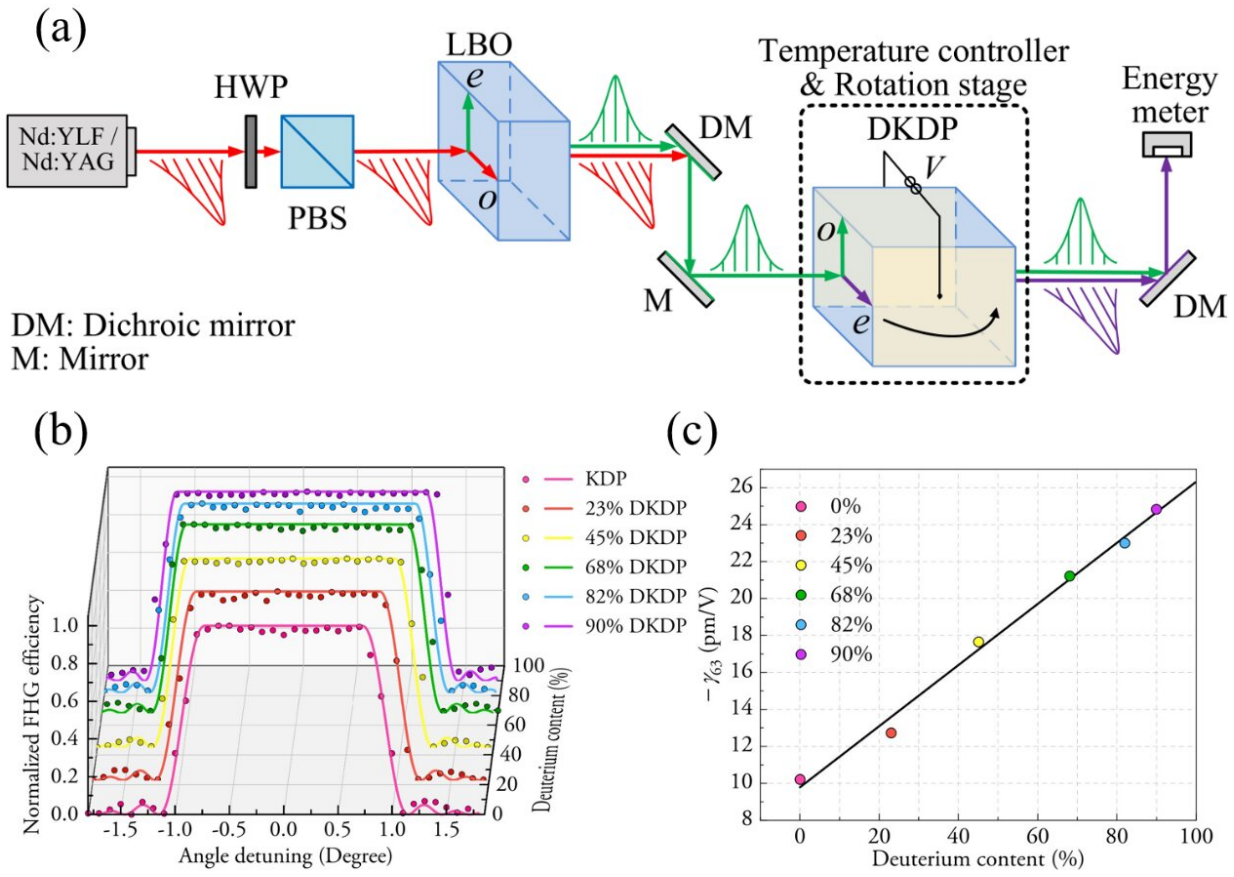

Fig.1 (a) experiment setup for measuring the linear EO coefficient of K(H1-xDx)2PO4 crystals; (b) FHG characteristics of different deuterium content DKDP crystals based on the VTPM; (c) Linear EO coefficients of K(H1-xDx)2PO4 crystals. Credit: SIOM

Recently, researchers from the Shanghai Institute of Optics and Fine Mechanics (SIOM) of the Chinese Academy of Sciences (CAS) have proposed a novel measurement method of the electro-optic (EO) coefficient based on the $\chi^{(2)}$ nonlinear optical technology to measure the linear EO coefficients of KH_2PO_4 (KDP) and $K(H_{1-x}D_x)_2PO_4$ (DKDP) precisely. Relevant results were published in *Optics Express* on Jan. 18, 2021.

Current studies and applications of the EO effect of KDP-family crystals mainly focus on KDP and DKDP with high deuterium content. For the partially deuterated KDP crystals, their EO coefficients are sporadically reported, although they have crucial applications in many fields. Meanwhile, the existing EO coefficient measurement methods are mainly based on the linear optical effect, which requires the laser to strictly keep the stability of polarization in the whole measurement system.

In this study, the researchers presented a novel method utilizing the $\chi^{(2)}$ nonlinear optical technology. This measurement only depends on the nonlinear process in nonlinear materials, and other transfer processes will not affect it.

Based on this method, the linear EO coefficients of a series of different deuterated KDP crystals were measured precisely, and a conclusion formula for determining the linear EO coefficients of DKDP crystals with different deuterium content was given.

Moreover, the stability of output fourth harmonic generation (FHG) energy can be greatly improved by using the EO properties of crystals, which provides important references for the deep ultraviolet laser generation and expanding the application of KDP-family crystals in the field of laser technology and nonlinear optics.

More information: Ziming Sun et al. Electro-optic coefficient measurement of a $K(H_{1-x}D_x)_2PO_4$ crystal based on $\chi^{(2)}$ nonlinear optical technology, *Optics Express* (2021). DOI: 10.1364/OE.415262

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