

EFFECT OF DEUTERATION ON THE SPECTRA OF SPONTANEOUS
PARAMETRIC LIGHT SCATTERING IN CRYSTALS OF THE
 $\text{KH}_{2x}\text{D}_{2(x-1)}\text{PO}_4$ SYSTEM

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Potassium dihydrogen phosphate (KDP) and dideuterium phosphate (DKDP) are widely used as nonlinear crystals. However, the optical properties of these crystals, especially DKDP, in the infrared region have not been thoroughly studied.

To investigate the changes in the infrared optical properties of crystals of the $\text{KH}_{2x}\text{D}_{2(x-1)}\text{PO}_4$ system under isotopic substitution of deuterium for hydrogen, we used a new method of spectroscopy - that of the spontaneous parametric scattering (SPS) of light. This method enables one to study the optical properties of crystals over a wide frequency range, in the region of the fundamental vibrations of the crystal lattice in particular, and also to investigate the lattice dynamics.

We measured the angular/frequency of SPS in $\text{KH}_{2x}\text{D}_{2(x-1)}\text{PO}_4$ crystals whose degree of deuteration varied from $x = 0$ to $x = 0.98$. On the basis of these spectra we measured the dispersion of the ordinary refractive index $n(\nu)$ in the frequency range $2000-4000 \text{ cm}^{-1}$ and the dependence of the refractive index on the deuterium concentration. The dispersion $\frac{\partial n(\nu)}{\partial x}$ measured at a frequency of 4100 cm^{-1} was 0.4×10^{-1} and at 3250 cm^{-1} was 0.7×10^{-1} , that is, the dispersion increased as the frequency of the hydrogen vibration was approached.

Studies of the phonon spectra showed that the oscillator strengths changed and the intensities of the lattice-vibration lines were redistributed in the $1200-2000 \text{ cm}^{-1}$ range as the degree of deuteration changed, and that the vibrations of the OH and OD bonds affected the vibrations of the other molecules in the unit cell of the crystal.

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