

**Zeitschrift:** Helvetica Physica Acta  
**Band:** 62 (1989)  
**Heft:** 6-7

**Artikel:** Off-axis configuration of F<sub>A</sub>(Li) centres in KF  
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**DOI:** <https://doi.org/10.5169/seals-116077>

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**OFF-AXIS CONFIGURATION OF  $F_A(\text{Li})$  CENTRES IN KF**

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**Abstract:** The off-axis configuration of  $F_A$  dipoles was identified in  $\text{KF}:\text{Li}^+$ . The centre tilt from the crystal axis is, as expected, larger in  $\text{KF}:\text{Li}^+$  than in  $\text{KCl}:\text{Li}^+$  and in  $\text{RbCl}:\text{Li}^+$ .

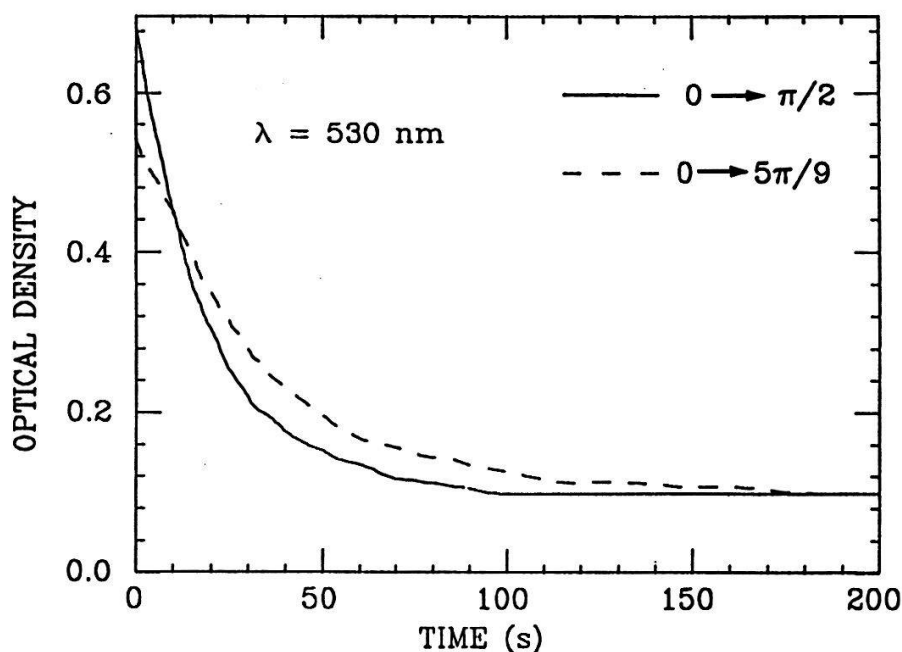
### 1. Introduction

The off-centre displacement of  $\text{Li}^+$  ions in crystals of alkali halides, showing a sufficiently large lattice parameter, was experimentally observed in  $\text{KCl}$  [1] and in  $\text{RbCl}$  [2], and theoretically calculated for several systems [3]. Such a peculiar configuration of the isolated impurity seems to be correlated in the above systems to a tilt from the crystal axis of the  $F_A$  dipole, formed by association of the impurity ion with a nearest-neighbour anion vacancy trapping an electron. The off-axis deviation of the  $F_A(\text{Li})$  centres was quantitatively determined both in  $\text{KCl}:\text{Li}^+$  [4] and  $\text{RbCl}:\text{Li}^+$  [5] by means of optical measurements. In this work the investigation on the configuration of  $F_A(\text{Li})$  dipoles is extended to  $\text{KF}:\text{Li}^+$ .

### 2. Experimental results and discussion

The technique used for studying the off-axis geometry of the  $F_A(\text{Li})$  centres is the analysis of their photostimulated reorientation under polarized optical pumping into the range of the  $F_A$  absorption [6]. The alignment process was theoretically treated, by taking into account both the off-axis effect of the dipoles and the overlap of the two  $F_A$  absorption bands, for experiments in equilibrium conditions [4] or during transient phenomena [7].

In  $\text{KF}:\text{Li}^+$  preliminary absorption measurements have been performed on transient effects. After thorough orientation of the centres by irradiation with monochromatic  $F_A$  light polarized along one of the crystal axes, the polarization plane of the incident beam was suddenly rotated: as a consequence, a depopulation occurs for centres lying parallel to the above direction, while the centre population along perpendicular directions increases correspondingly. The initial absorption  $\alpha(0)$  and the steady-state absorption  $\alpha(\infty)$ , measured for two different rotations of the polarization plane of the exciting light (Figure 1),



**Figure 1:** Kinetics of the  $F_A(\text{Li})$  centre photostimulated reorientation in  $\text{KF}:\text{Li}^+$  at 77 K.

allow the calculation of both the off-axis angle  $\theta$  of the  $F_A$  dipoles and the ratio  $R$  of the cross sections related to the two  $F_A$  transitions.

From these and other results, obtained at various wavelengths of the pumping light, it is possible to deduce a first approximate evaluation of  $\theta$  in  $\text{KF}:\text{Li}^+$ , which is slightly bigger than  $10^\circ$ . Such value, to be confirmed by luminescence experiments at various temperatures, is larger than those in  $\text{KCl}:\text{Li}^+$  and in  $\text{RbCl}:\text{Li}^+$ , as expected because of the more pronounced displacement of the isolated  $\text{Li}^+$  ion in this system [3].

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