# BIREFRINGENCE AND MAGNETO-OPTICAL PROPERTIES OF $F_2^+$ CENTER IN KCl

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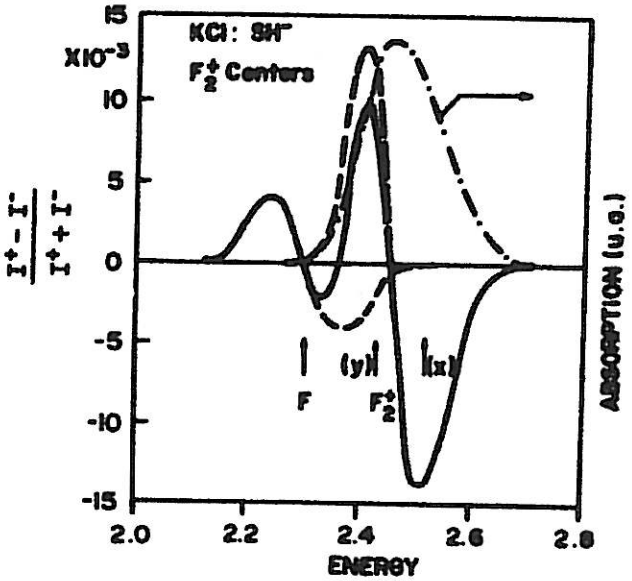
The basic optical properties of the $F_2^+$ center in KCl have been studied in detail several years ago by Aegerter and Lüty[1]. More recently, with $OH^-$ or $SH^-$ dopped crystals Gellerman et al[2] were able to create high concentrations of these defects, thermally stable till ~-30°C; in KCl:$SH^-$ it was even possible to obtain $F_2^+$ centers in a sample almost free of F and $F_2$ centers and to observe the main π absorption bands $1s\sigma g \rightarrow 2p\pi_x$ at 493nm and $1s\sigma g \rightarrow 2p\pi_y$ at 509nm without interference with the usually underlying F and $F_2$ bands. The details of the $F_2^+$ creation are not yet known. This open the way to study by direct methods other fundamental optical properties which where impossible to obtain before.

The creation of $F_2^+$ centers in KCl:$SH^-$ was made following a receipt given by Gellerman et al[2]: the samples[3] have been X-rayed at ~-40°C and bleached under F light at the same temperature. Light irradiation in the π bands for T > 30 K allows the $F_2^+$ to reorient along the (110) directions. We found that during this procedures, the crystal become strongly birefringent: a linear polarized light impinging on it comes out elliptically polarized; with a non isotropic $F_2^+$ center system the tensor of the refractive indices become anisotropic and the amplitudes $a_{[0\bar{1}1]}$ and $a_{[011]}$ of the emerging light have a phase difference given by $\delta = 2\pi d/\lambda[n_{[0\bar{1}1]} - n_{[011]}]$; they combine to give an elliptically polarized light. The dispersion spectra of the $F_2^+$ center will be reported for $400 < \lambda < 1600$ nm. The high sensitivity of the measurements shows that in KCl:$SH^-$, the $F_2^+$ centers still reorient at 4.2 K.

The magnetic circular dichroism, MCD, of the $F_2^+$ center, measured in absorption under high field $0 < B < 5T$ and for $1.4 < T < 50K$ will be reported. The figure shows a typical result for the π transitions obtained at 3.44 T and 1.4K with unaligned defects. The σ transition shows a very weak negative MCD of the order of $10^{-5}$. Extreme care should be taken in

order to not perturb the population equilibrium of the defects; slight variation induces much stronger dichroism due to the birefringent effect which can be easily observed at zero field.

MCD measurements in emission and absorption with aligned $F_2^+$ centers under various geometry are underway in order to study directly the contribution of each π transitions. Optical detection of EPR is also planned and will be reported.




Absorption (.-.-.) and MCD measurements (——) of unaligned $F_2^+$ centers in KCl:$SH^-$ at 1.4K and 3.44T. Full curve is decomposed into the F and $F_2^+$ components respectively (- - -).

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REFERENCES

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2. W. GELLERMAN, F. LÜTY, K.P. KOCH and H. WELLING, Optics Commun. 35, 430 (1980).
3. The samples have been kindly supplied by Prof.Dr. F. Lüty.