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Linear birefringence, linear dichroism and Faraday rotation of CeF_3 single-crystal along the perpendicular to the optic axis

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The measurements of chiroptical properties such as natural optical activity (NOA) and circular dichroism (CD) in condensed matters are extremely difficult because coexisting linear birefringence (LB) and linear dichroism (LD) caused by their anisotropy greatly overwhelm NOA and CD. Therefore the chiroptics in solid states had not been promoted compared with those in solution states. We have developed the Generalized-High Accuracy Universal Polarimeter (G-HAUP) for measuring simultaneously LB, LD, NOA and CD of any anisotropic materials [1-2]. The G-HAUP has opened solid state chiroptics. Meanwhile, not only NOA but also Faraday rotation (FR) can be measured when magnetic field parallel to the light propagation direction was applied to the sample.

Faraday rotator single-crystals have attracted much attention in the field of magneto-optics due to their broad applications such as optical isolators. In particular, rare-earth (RE) fluorides (CeF_3, PrF_3 and $LiREF_4$) single-crystals have been investigated because they exhibit their unique and good transmittance in the UV wavelength region [3-4]. The magneto-optical effects of the RE ions are known to be caused by the intra-ionic parity allowed electric dipole transition between the $4f^N$ and $4f^{N-1}5d^1$ configurations. These transitions are close to the absorption cut-off in the widely transparent fluorides, which leads to outstanding Verdet constants in the UV wavelength region.

In this study, we measured wavelength dependences of LB, LD and optical rotation (NOA and FR) of CeF_3 single-crystal along the optic and perpendicular to the optic axes with the G-HAUP without/under applied magnetic field parallel to the light propagation direction.

Fig. Appearance of the G-HAUP

Reference:

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