Control of Light by Magnetic Field

Optical magnetoelectric effect in a patterned polar ferrimagnet

A simple method to dramatically enhance the optical magnetoelectric (ME) effect is proposed and demonstrated for a polar ferrimagnet $GaFeO_3$. We patterned a simple grating with a period of 4 μm on a surface of $GaFeO_3$ crystal and used the diffracted light as a probe. The optical ME modulation signal for the Bragg spot of the order n=1 reaches 1–2% of the bare diffracted light intensity in a magnetic field of 500 Oe, which is amplified by more than 3 orders of magnitude compared to that for the reflection of bulk $GaFeO_3$.

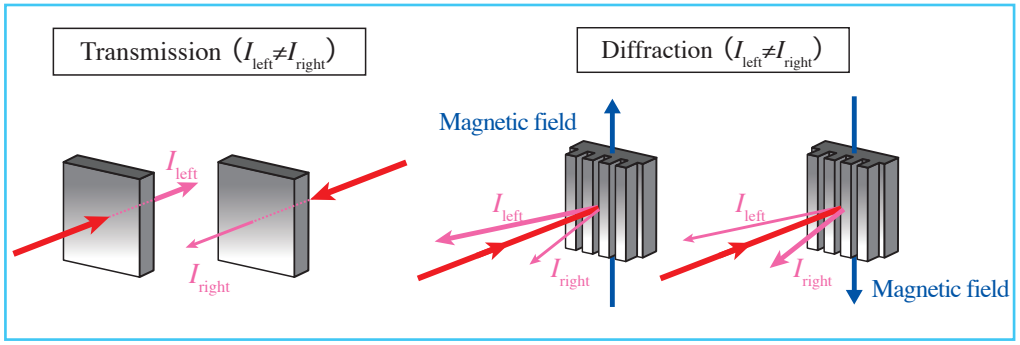

Figure : Optical ME effect in transmission (left) and diffraction (right) geometries.

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Spinning of High-Strength Fiber Using Single-Walled Carbon Nanotubes

Establishing a technology to produce high-quality single-walled carbon nanotubes for industrial applications without aftertreatments

We have developed a novel synthesis method for single-walled carbon nanotubes(SWNTs) which are expected to be the core material for nanotechnologies. This method modified from the direct injection pyrolytic synthesis method has dramatically achieved high purity and a high degree of graphitization by controlling the reaction conditions accurately. The purity of the nanotubes increased from 50% to 97.5% and the structural defects in the nanotubes were reduced to one tenth of the previous level. Without purification processes, surface treatments or binders, these high quality SWNTs can be used to make high-strength threads (SWNT wire) and SWNT mesh sheets.

Figure : An origami crane made from a non-purified high-quality SWNT sheet (sheet thickness: approximately 9 micrometers)

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