204.Title: Gigantic terahertz magnetochromism via electromagnons in the hexaferrite magnet $Ba_2Mg_2Fe_{12}O_{22}$

Author: Kida, N; Kumakura, S; Ishiwata, S; Taguchi, Y; Tokura, Y

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Abstract: Effects of temperature (6-225 K) and magnetic field (0-7 T) on the low-energy (1.2-5 meV) electrodynamics of the electromagnon, the magnetic resonance driven by the light electric field, have been investigated for a hexaferrite magnet $Ba_2Mg_2Fe_{12}O_{22}$ by using terahertz time-domain spectroscopy. We find the gigantic terahertz magnetochromism via electromagnons; the magnetochromic change, as defined by the difference of the absorption intensity with and without magnetic field, exceeds 500% even at 0.6 T. The results arise from the fact that the spectral intensity of the electromagnon critically depends on the magnetic structure. With changing the conical spin structures in terms of the conical angle. from the proper screw (theta = 0 degrees) to the ferrimagnetic (theta = 90 degrees) through the conical spin-ordered phases (0 degrees < theta < 90 degrees) by external magnetic fields, we identify the maximal magnetochromism around theta approximate to 45 degrees. On the contrary, there is no remarkable signature of the electromagnon in the proper screw and spin-collinear (ferrimagnetic) phases, clearly indicating the important role of the conical spin order to produce the magnetically controllable electromagnons. The possible origin of this electromagnon is argued in terms of the exchange-striction mechanism.