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Directional dichroism at the spin-wave excitations of multiferroic Ni3TeO6

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In physical systems simultaneously breaking time-reversal and spatial inversion symmetries the strength of absorption for two counter-propagating light beams can be different irrespective of the polarization state of light [1], which phenomenon is termed as non-reciprocal directional dichroism. Until recent experiments on multiferroic materials [2, 3] this effect was generally found to be weak.
Directional dichroism of multiferroics in the far-infrared spectral range is the consequence of the optical magnetoelectric effect, i.e. the coupled dynamics of spins and local electric dipoles[4]. Spin-wave modes in multiferroics can simultaneously be excited by the electric and magnetic components of light, hence, they can be viewed as the "elementary excitations"of such hybrid magnetoelectric response. Indeed multiferroic Ni3TeO6 [5] shows strong directional dichroism in its spin excitations, even for unpolarized light. The temperature- and magnetic field dependence of these resonances was followed up to the Néel temperature and up to 30 T, respectively.

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