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Time-resolved imaging of magnetoelectric switching in $MnWO_4$[1] TIM HOFFMANN, PHILIP THIELEN, HISKP, University Bonn, Germany, PETRA BECKER, LADISLAV BOHATY, Institute of Crystallography, University of Cologne, Germany, MANFRED FIEBIG, Department of Materials, ETH Zurich, Switzerland — The interaction of magnetic and ferroelectric order is intrinsically strong in spin-spiral multiferroics. Here the complex magnetic long range order breaks inversion symmetry and induces a spontaneous electric polarization. The interaction allows to switch the magnetic order by an electric field and is thus of great interest for applications. Although such magnetoelectric switching is a major goal in multiferroics, hardly any work was devoted to the dynamic aspects of the actual switching process. Here we report time-resolved optical second harmonic generation measurements of the electric-field-induced reversal of the spin-spiral domains in multiferroic MnWO4. Ferroelectric and magnetic orders appear to remain rigidly coupled even during the non-equilibrium state of the transition. The switching is governed by domain wall motion on the millisecond time scale. Even though, locally domains can disappear within nanoseconds. The slow global response can be explained by an energy estimate: As the dipole energy in the electric field is much weaker than the magnetic anisotropy energy, the electric field is only a weak lever for manipulating the magnetic system. Therefore magnetoelectric switching in this compound is inherently slow.

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