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Transition-metal dihalide MX_2 as magnetoelectric multiferroics SHINICHIRO SEKI, TAKASHI KURUMAJI, SHINTARO ISHIWATA, HIROYUKI MATSUI, YOSHINORI TOKURA, University of Tokyo, HIROSHI MURAKAWA, YUSUKE TOKUNAGA, YOSHIO KANEKO, ERATO-JST, TATSUO HASEGAWA, AIST — Magnetoelectric properties were investigated for transition-metal dihalide MX_2, which turns out to be the first example of non-chalcogen based spiral-spin induced multiferroics. We discovered the emergence of ferroelectric polarization (P) in helimagnetic state for several compounds such as $CuCl_2$ with edge-shared $S = 1/2$ chain and MnI_2 with stacked triangular lattice. In the latter material, in-plane magnetic field (H) was found to induce the rearrangement of six possible multiferroic domains. With every 60°-rotation of H around the c-axis, discontinuous 120°-flop of P-vector is observed as a result of the flop of magnetic modulation vector (q). In-plane H also alters the stable direction of q-vector from original $q \parallel \langle 1\bar{1}0 \rangle$ to $q \parallel \langle 110 \rangle$ above 3 T, which leads to significant change of P-flop patterns under rotating H. At the critical field region ($\sim$ 3T), due to the enhanced q-flexibility, P-vector smoothly rotates clockwisely twice while H rotates counter-clockwisely only once.

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