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Spin lattice coupling in multiferroic $[(CH_3)_2NH_2]Mn(HCOO)_3$
KENDALL HUGHEY, AMANDA CLUNE, AMAL AL-WAHISH, MICHAEL YOKOSUK, SHIYU FAN, Univ of Tennessee, Knoxville, NANDITA ABHYANKAR, Florida State University, National High Magnetic Field Laboratory, HONGJUN XIANG, Fudan University, NARESH DALAL, Florida State University, National High Magnetic Field Laboratory, ZHIQIANG LI, National High Magnetic Field Laboratory, JANICE MUSFELDT, Univ of Tennessee, Knoxville — Multiferroic metal-organic framework $[(CH_3)_2NH_2]Mn(HCOO)_3$ is a superior platform for investigating magnetically driven transitions and the magnetoelastic effect because the low energy scales and soft organic linkers are easily influenced by external stimuli. By analyzing the vibrational properties under temperature and magnetic field, we unravel the microscopic details of the 185 K order/disorder transition and determine that ferroelectricity stems from a combination of the ordering of a counterion and a distortion of the formate framework. We also reveal that spin-lattice coupling in $[(CH_3)_2NH_2]Mn(HCOO)_3$ is different from rare earth manganites and more analogous to behavior in quantum magnets where few local lattice distortions stabilize the fully polarized state.

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