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The complex multiferroic phase diagram of $Mn_{1-x}Co_xWO_4$[1] B. LORENZ, K.-C. LIANG, TCSUH and Dept. of Physics, University of Houston, Y. Q. WANG, Y.Y. SUN, TCSUH, University of Houston, F. YE, J.A. FERNANDEZ-BACA[2], H.A. MOOK, Neutron Scattering Science Division, Oak Ridge National Laboratory, C.W. CHU[3], TCSUH and Dept. of Physics, University of Houston — $MnWO_4$ is a classical multiferroic where ferroelectricity is induced by an inversion symmetry breaking helical spin order. The origin of the helical order is found in competing magnetic exchange interactions with strong uniaxial anisotropy, resulting in magnetic frustration. The microscopic parameters can be tuned by chemical substitution of Fe, Zn, or Co for Mn. The effects of Co substitution up to 30% on the magnetic structure and the ferroelectric (FE) phase are investigated. The multiferroic phase diagram of $Mn_{1-x}Co_xWO_4$ is completely resolved. At low Co content, the FE polarization is oriented along the b-axis and decreases with increasing x. At doping levels between 7.5% and 12% Co, the polarization points along the a-axis and it reaches a maximum value of 90 $\mu C/m^2$ at x=10%. With further increasing x, the FE polarization rotates back to the b-axis. Its magnitude decreases continuously and vanishes above 30% Co content. This complex behavior comes along with a delicate sequence of different magnetic phases which are explored by magnetization, heat capacity, and neutron scattering experiments.

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