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**Successive magnetic phase transitions and multiferroicity in quasi-two-dimensional triangular lattice Heisenberg antiferromagnets $Ba_3CoNb_2O_9$ and $Ba_3MnNb_2O_9$**[1] M. LEE, J. HWANG, E.S. CHOI, National High Magnetic Field Laboratory, FL, USA, J. MA, C.R. DELA CRUZ, Oak Ridge National Laboratory, TN, USA, M. ZHU, X. KE, Michigan State University, MI, USA, Z.L DUN, H.D. ZHOU, University of Tennessee, TN, USA — We have measured magnetic, dielectric and thermodynamic properties of quasi-two-dimensional triangular lattice antiferromagnet (TLAF), $Ba_3CoNb_2O_9$ (S= 1/2) and $Ba_3MnNb_2O_9$ (S= 3/2). At zero magnetic field, $Ba_3CoNb_2O_9$ undergoes a two-step transition at 1.36 K and 1.10 K and enters a 120 degree ordered state. By applying magnetic fields, a series of magnetic phases with fractional saturation magnetization (1/3, 1/2, 2/3 (or $\sqrt{3}$/3Ms) are observed. The collinear spin phase with 1/3 Ms becomes more robust at lower temperatures due to quantum fluctuations. For $Ba_3MnNb_2O_9$, the 120 degree ordered state is stabilized below 3.10 K at zero field. Under the magnetic field, successive magnetic phase transitions are observed with fractional magnetization 1/3 and 1/2 Ms. The 1/3 Ms phase becomes more stable at higher temperatures due to thermal fluctuations. The ferroelectricity emerges in all spin states in both compounds regardless of the spin chirality. Therefore, $Ba_3CoNb_2O_9$ and $Ba_3MnNb_2O_9$ are unique TLAFs exhibiting not only a series of magnetic phase transitions but also multiferroicity.

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