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Crystal and magnetic structures of the three-dimensional spin-Peierls state of ZnCr2O4 SUNGDAE JI, S.-H. LEE, University of Virginia, C. BROHOLM, Johns Hopkins University, W. RATCLIFF II, NIST Center for Neutron Research, S.-W. CHEONG, Rutgers University, P. ZSCHACK, University of Illinois at Urbana-Champaign — The geometrically frustrated spinel $ZnCr_2O_4$ undergoes a three-dimensional spin-Peierls phase transition at $T_N = 12.5$ K from a cubic paramagnetic state to a tetragonal Neel state. The exact nature of the lattice distortion, and the one-to-one-correspondence between the distortion and the magnetic ground state has been a long standing issue. To unveil the mystery, we have performed synchrotron X-ray diffraction measurements on a single crystal of this compound and neutron diffraction measurements on a powder sample. Our detailed analysis of the single crystal X-ray data shows that below T_N the symmetry of the crystal structure is lowered from the cubic $Fd\bar{3}m$ to the tetragonal $I\bar{4}m2$ due to formation of a complex pattern of Cr-Cr clustering. The relation between the distorted crystal structure and the magnetic structure will also be discussed.

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