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Pressure tuned phonon mode splitting in magnetic frustrated spinel $ZnCr_2O_4$ TAO ZHOU, ZHEN QIN, New Jersey Institute of Technology, ZHENXIAN LIU, Brookhaven National Lab, CHENGLIN ZHANG, SANG-WOOK CHEONG, Rutgers University — $ZnCr_2O_4$ has cubic spinel structure. Below 390 K, the geometrically frustrated magnet enters a paramagnetic state. Below 12.5 K, it undergoes a first-order phase transitions, resulting into an antiferromagnetic order and a structural distortion simultaneously. An IR-active phonon related to the Cr^{3+} ion's motion undergoes a splitting at 12.5 K. This transition is explained as a spin-Peierls like transition. However, the exact cause and effect in such a transition is not clear. Is it because the lattice undergoes transition first, spin just follows, or is it spins' interaction that forces the lattice to undergo changes? Pressure can provide a crucial service in clarifying this issue, since pressure can change spin and lattice interactions in different ways, it can differentiate these two scenarios. We have measured the infrared absorption spectra of $ZnCr_2O_4$ under pressure. Our data shows that Tc, at which the spin-Peiers like transition occurs and the phonon at about 370 cm^{-1} starts to show the splitting, increases from its ambient pressure value of 12.5 K to about 15.8 K at 1 GPa. This provides an important clue for the exact nature of this transition.

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