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Glassy phonons and magnon-phonon coupling in the shape memory strain glass alloy $Ni_{45}Co_5Mn_{36.6}In_{13.4}$ PAUL STONAHA, MICHAEL MANLEY, Oak Ridge National Lab, ORNL SCATTERING AND THERMOPHYSICS TEAM, TEXAS AM MECHANICAL ENGINEERING TEAM — The magnetocaloric effect describes the coupling between a materials temperature and its magnetic state. Modern magnetocaloric devices employ materials which undergo a change in magnetic order coinciding with a martensitic (first-order) phase transition. A drawback of the martensitic transformation is the requirement of large magnetic fields (>2T) and the accompanying structural hysteresis. In this talk, we discuss the magnetocaloric effect in the shape memory alloy $Ni_{45}Co_5Mn_{36.6}In_{13.4}$ near its Curie temperature. In its austenite phase, this material exists in a frustrated ferromagnetic / antiferromagnetic state. We show that the TO [H00] phonon in this material is coupled to magnetism, and that the application of a magnetic field effects this phonon enough to appreciably change the vibrational entropy. We present the results of frozen phonon calculations that show how the phonon couples to magnetism at the atomic level. We also discuss the stain glass state of this material, in which the TA2 phonon is heavily damped both above and below the strain glass transition temperature. The results imply a new outlook on the source of the strain glass state.

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