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Low Temperature Structural Phase Transitions in Novel Oxides
CHRIS KENDZIORA, Naval Research Laboratory, IVAN A. SERGIENKO, D. G. MANDRUS, B. C. SALES, R. JIN, Oak Ridge National Laboratory, P. KHALIFAH, Dept. of Chemistry, University of Massachusetts, Amherst, JIAN HE, Dept. of Physics, Clemson University — Analysis of the Raman active phonon modes offers a symmetry dependent determination of structural phase transitions. We have performed polarized Raman scattering measurements on oriented single crystals of the superconducting pyrochlore $Cd_2Re_2O_7$ and the layered ruthenate $La_4Ru_2O_{10}$ as a function of temperature. In $Cd_2Re_2O_7$ we resolve and assign each of the six Raman-active (A_{1g} + E_g + $4F_{2g}$) modes of the room temperature cubic phase. Below the structural phase transition at 200K (and 120K) we observe new symmetry dependent Raman-active vibrations associated with a cubic-tetragonal (tetragonal-tetragonal) phase transition. We identify two "soft" modes and discuss a structural order parameter with E_u symmetry. We measure $La_4Ru_2O_{10}$ through the monoclinic-triclinic phase transition @ 150K and compare the symmetry dependent results with expectations based on x-ray structural analysis.

Chris Kendziora
Naval Research Laboratory

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