Far-infrared optical properties of pyrochlore heavy fermion superconductor Cd$_2$Re$_2$O$_7$ in the normal and superconducting states

M. REEDYK, M. HAJIALAMDARI$^2$, D.A. CRANDLES, F.S. RAZAVI, Dept. Physics, Brock University, R.K. KREMER, Max Planck Institute for Solid State Research — Cd$_2$Re$_2$O$_7$ is a pyrochlore oxide which exhibits superconductivity with a transition temperature $T_C$ near 1 K. The far-infrared optical properties of Cd$_2$Re$_2$O$_7$ will be presented at temperatures above and below $T_C$. Superconductivity induced changes in the phonon structure are observed. Thermal reflectance spectra show two absorption features, near 9.6 and 19.3 cm$^{-1}$ which arise in the superconducting state. Optical conductivity spectra reveal a softening ($\sim$ 1 cm$^{-1}$) of the phonon mode at 35 cm$^{-1}$ in the superconducting state. Analysis of the frequency dependent optical effective mass and scattering rate support the classification of this material as a modest heavy electron system at low temperatures.

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$^2$currently at the University of Waterloo

Maureen Reedyk
Dept. Physics, Brock University

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