Infrared properties of the bismuth pyrochlores

MINGHAN CHEN, DAVID TANNER, Dept. of Physics, University of Florida, JUAN NINO, Dept. of Materials Science and Engineering — We measured the temperature dependence of the reflectivity spectra of cubic bismuth pyrochlores Bi$_{3/2}$ZnTa$_{3/2}$O$_7$ (BZT), Bi$_{3/2}$MgNb$_{3/2}$O$_7$ (BMN), Bi$_{3/2}$MgTa$_{3/2}$O$_7$ (BMT) and Bi$_{3/2}$(Zn$_{0.92}$Nb$_{1.5}$)O$_{6.92}$ (BZN) by infrared spectroscopy from 30 to 3300 cm$^{-1}$ between 50 and 300K. The optical constants were estimated by Kramers-Kronig analysis and classical dispersion theory. Infrared-active phonon modes were assigned to specific bending and stretching vibrational modes. Of particular interest is a previously unassigned IR mode at $\sim$850 cm$^{-1}$ which may suggest a complex structure. Splitting of the B-O and O-B-O stretching phonons is attributed to mixed cation occupancy. The temperature dependences of the phonon frequencies and the damping coefficients indicate a decrease of lattice constant and orientation disorder at low temperatures.

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