**Predicting Thermal Conductivity of Defected Systems using Spectral Energy Density**

Accurately predicting the thermal conductivity of dielectric materials requires a detailed analysis of phonon properties. Of particular interest are the phonon lifetimes (mean free paths), which are difficult (or impossible) to measure in experiment. Common techniques use the periodicity of “pure” crystalline systems to analyze the properties of the phonons. However, these techniques break down when the system’s periodicity is broken (i.e. defected). Spectral Energy Density can measure the phonon properties of defected systems if the defects are a small perturbation. Alloys (A1-xBx) with mass and bond defects can be analyzed up to concentrations of roughly x=0.1. The phonon lifetimes of these defected systems show a scaling to the 4th power of the inverse of the phonon frequency (as predicted by such and such?). The phonon dispersion is shown to agree well with predictions using a virtual crystal approximation.