

# Nuclear inelastic scattering studies of lattice dynamics in thermoelectric materials

R. P. Hermann

*Institut für Festkörperforschung, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany*

Measurements of the phonon density of states in thermoelectric material have significantly contributed to our understanding of the origin of the low lattice thermal conductivity of these materials. Inelastic neutron scattering and heat capacity measurements were the first techniques to validate the “rattling” atom concept that is a cornerstone in this understanding. These measurements were then complemented by a determination of the element specific density of states by nuclear inelastic scattering. We have carried out phonon DOS measurements at the  $^{151}\text{Eu}$ ,  $^{121}\text{Sb}$ , and  $^{57}\text{Fe}$  nuclear resonances. The results from these measurements on  $\text{EuFe}_4\text{Sb}_{12}$ ,  $\text{Eu}_8\text{Ga}_{16}\text{Ge}_{30}$ , and  $\text{Zn}_4\text{Sb}_3$  will be presented in parallel with inelastic neutron scattering results. [The European Synchrotron Radiation Facility is acknowledged for provision of the synchrotron radiation facility at beamlines ID18 and ID22N. The European Community - Access to Research Infrastructure action of the Improving Human Potential Programme HPRI-2001-00175 is acknowledged for provision of neutron scattering beam time at the FRJ-II research reactor in Jülich, Germany.]