PHYSIKALISCHES KOLLOQUIUM

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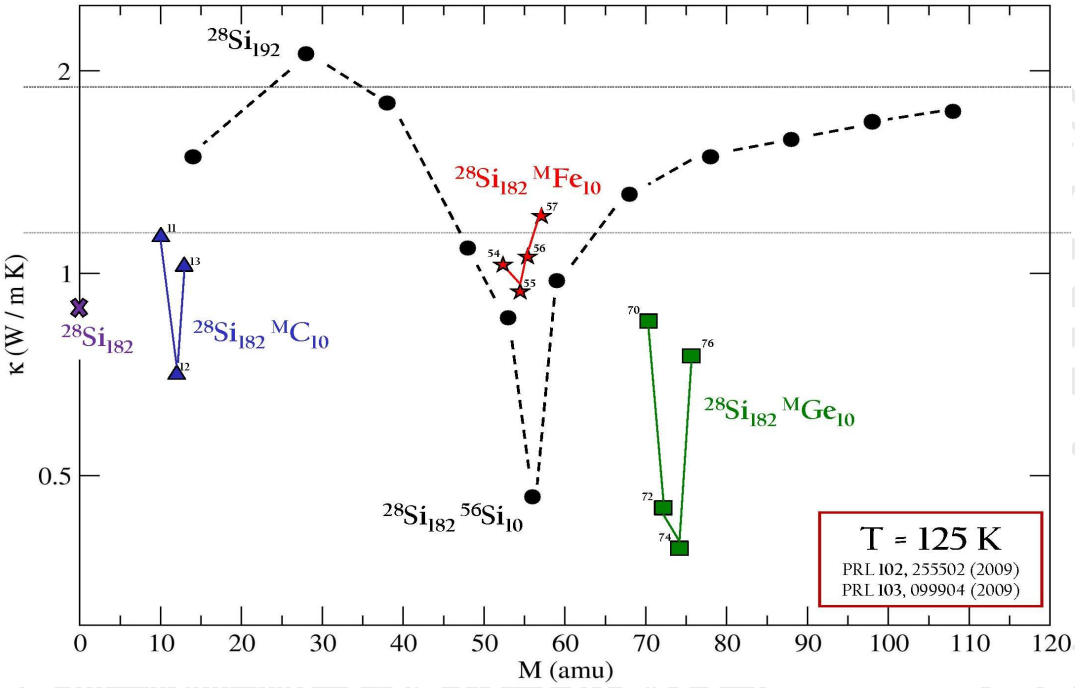
IM GROßEN HÖRSAAL



NON-EQUILIBRIUM DYNAMICS OF LOCALIZED PHONONS IN SEMICONDUCTORS: ISOTOPE EFFECTS

PROF. DR. STEFAN K. ESTREICHER

PHYSICS DEPARTMENT

TEXAS TECH UNIVERSITY

Impurities in crystalline materials introduce localized vibrational modes. The coupling of these modes to each other and to the host crystal phonons is sometimes isotope-dependent. For example, the lifetime of the asymmetric stretch of O in Si nearly doubles upon substitution of one of its ^{28}Si nearest neighbors by ^{29}Si, a substitution which shifts the frequency of the mode by only 0.1 %! Ab-initio non-equilibrium molecular-dynamics simulations can explain this isotope effect. But this theory also predicts unexpectedly large impurity isotope effects in the thermal conductivity of Si nanostructures. This effect has yet to be measured. Not all impurities, not even all isotopes are created equal...