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时间： 11月30日（周四），上午10:00-11:00

地点： 南校区第一实验楼423会议室

DESIGNING THE SPECTRAL BEHAVIOUR OF THERMAL PHONONS IN NANOSTRUCTURES

报告摘要:

With the recent advancement of experimental and numerical methods, the complex modal content of the phonon heat flux has been progressively uncovered in bulk materials but also in nanostructures and molecular systems. Key quantities such as the mode relaxation time or mean free path, which had been known only for simplified mode dispersions, were finally extracted. And while state-of-the-art descriptions based on differential transport equations would mainly rely on bulk properties, the impact of atomic scale mechanisms on heat conduction has been revealed.

As a first step, the predominant role of the spectral content of phonon heat flux at interfaces is firstly emphasized by experimental investigations revealing frequency selection mechanisms [1]. This behaviour was envisioned by Adamenko and Fuks several decades ago to explain Kapitza resistance and we will show the experimental validation of their theory.

A new theoretical path is then proposed to unravel the spectral content of phonon interfacial conductance based on Molecular Dynamics simulations. This method directly provides mode-to-mode phonon transmission, including anharmonic contributions in solid-solid [2] as well as at solid-liquid interfaces [3]. We will show that this method can also be extended to provide the spectral mean free path in systems with translation symmetry.

Further illustrations will finally be provided to show how the spectral phonon distribution can be analyzed and controlled via resonator structures [4], molecular functionalization [5,6], disorder [7], defects [8] and Phononic Crystals [9].

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[7] JeremieMaire, Roman Anufriev, Ryoto Yanagisawa, AymericRamière and Sebastian Volz and Masahiro Nomura, submitted, https://arxiv.org/abs/1508.04574.

[8] Van-Truong Tran, Jérôme Saint-Martin, Philippe Dollfus and Sebastian Volz, submitted.

[9]Nomura, M., Nakagawa, J., Sawano, K., Maire, J., & Volz, S., Thermal conduction in Si and SiGephononic crystals explained by phonon mean free path spectrum. Applied Physics Letters, 109(17), 173104–5, (2016).