HYBRID FOLDED PHONONS IN TWISTED GRAPHENE

D.L. NIKA[1], A.I. COCEMASOV[1], A.A. BALANDIN[2]

[1]E. Pokatilov Laboratory of Physics and Engineering of Nanomaterials, Department of Physics and Engineering, Moldova State University, Chisinau, MD-2009, Republic of Moldova

[2]Nano-Device Laboratory and Phonon Optimized Engineered Materials Center, University of California – Riverside, California 92521, USA

We theoretically investigated phonon dispersion and specific heat in AA-stacked, AB-stacked and twisted bilayer graphene with various rotation angles. Twisting bilayer graphene leads to emergence of new phonon branches – termed *hybrid folded phonons* – which originate from mixing of phonon modes from different high-symmetry directions in the Brillouin zone. The frequencies of the hybrid folded phonon depend strongly on the rotation angle and can be used for non-contact identification of the twist angles in graphene samples. It was also shown that the dispersion of the out-of-plane acoustic phonons – referred to as *ZA* phonons – deviates strongly from a parabolic law starting from the frequencies as low as ~100 cm^{-1}. This leads to the frequency-dependent *ZA* phonon density of states and the breakdown of the linear dependence of the specific heat on temperature.

Unterstützt von / Supported by
Alexander von Humboldt
Stiftung/Foundation