

Still surprises of heat transport in harmonic crystals

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We revisit the classical problem of heat transport in a harmonic crystal by coupling the elastic chain to a thermal bath via a soft-matter inspired interaction. Despite the standard equilibrium relations being still satisfied, we find that the stationary heat current is non-monotonic in the temperature gradient. This negative differential conductivity is solely due to the coupling of the chain oscillators with the soft matter bath, using a Bernoulli-Euler scheme where the bending of the elastic string enters. We have also computed the specific heat for such a thermally conducting chain, which should be widely relevant for high-temperature oscillations of heat-conducting molecules and gases.