

Disorder-free weak dynamic localization in deformable lattices

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© 2018 IOP Publishing Ltd. We study the electron transport in a deformable lattice modeled in the semiclassical approximation as a discrete nonlinear elastic chain where acoustic phonons are in thermal equilibrium at temperature T . We reveal that an effective dynamic disorder induced in the system due to thermalized phonons is not strong enough to produce Anderson localization.

However, for weak nonlinearity we observe a transition between ballistic (low T) and diffusive (high T) regimes, while for strong nonlinearity the transition occurs between the localized soliton (low T) and diffusive (high T) regimes. Thus, the electron-phonon interaction results in weak temperature-dependent dynamic localization.